ATTACHMENTS



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Strand Associates, Inc.® (SA)

Stormwater Management Plan Update

City of Sheboygan

October 12, 2021

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(608) 251-4843

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City of Sheboygan
spirit on the lake.

Overview

- Introduction
- Current/Updated Stormwater Program
- Northeast Lakeshore Basin TMDL
- Stormwater Quantity Modeling
- Stormwater Quality Modeling
- Alternatives Analysis
  - BMPs in City
  - Water Quality Trading
  - Watershed Adaptive Management
- Concept-Level Stormwater Utility Feasibility Study
- Recommendations



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Introduction

- Wisconsin Pollutant Discharge Elimination System (WPDES) Permitted Municipally Separate Storm Sewer Systems (MS4)
- WPDES Permit No. WI-S049867-03 (Effective-8/20/14; Expiration-8/20/19)
- City Stormwater Plans: Original (1996); Update (2007-modeling)
- MS4 and Northeast Lakeshore TMDL Requirements

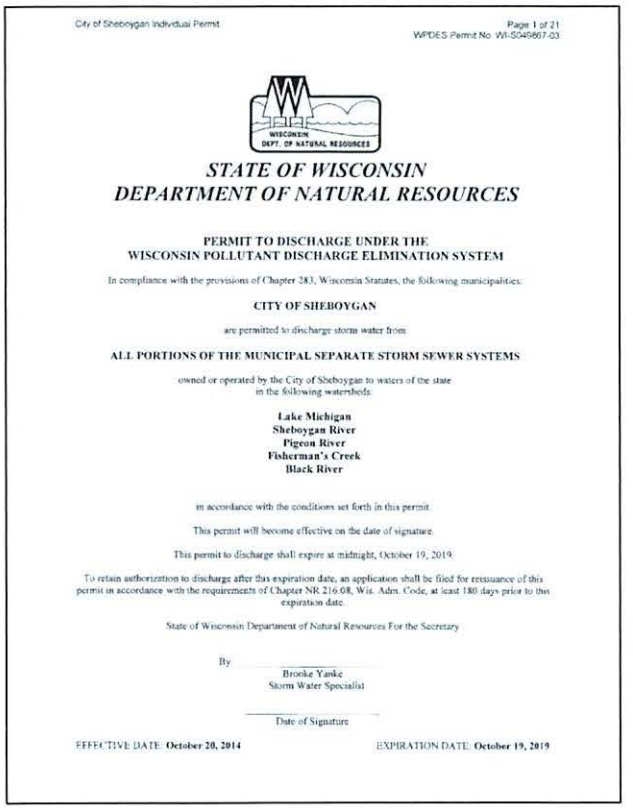
	MS4	TMDL	
Reach	TSS Reduction (%)	TSS Reduction (%)	TP Reduction (%)
All (assumed)	20%	40%-assumed	27%-assumed

TSS = Total Suspended Solids (Sediment)
TP = Total Phosphorus
TMDL Reaches in City: 10, 11, 24, 27, 40, 154, 238, 239, 315, 316, 317

- The Sheboygan River, Pigeon River, Black River, and an unnamed tributary to Fourmile Creek are 303(d) listed impaired waters.
- Updated plan prepared to address changing requirements and existing conditions TSS & TP removals in the City
- A variety of compliance options were evaluated.

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WPDES Permit-Required Stormwater Program



City of Sheboygan Individual Permit — Page 1 of 21
WPDES Permit No. WI-S045867-03

WISCONSIN DEPT. OF NATURAL RESOURCES

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of Chapter 283, Wisconsin Statutes, the following municipalities:

CITY OF SHEBOYGAN

are permitted to discharge storm water from

ALL PORTIONS OF THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS

owned or operated by the City of Sheboygan to waters of the state in the following watersheds:

Lake Michigan
Sheboygan River
Pigeon River
Fisherman's Creek
Black River

in accordance with the conditions set forth in this permit.

This permit will become effective on the date of signature.

This permit to discharge shall expire at midnight, October 19, 2019.

To retain authorization to discharge after this expiration date, an application shall be filed for reissuance of this permit in accordance with the requirements of Chapter NR 216.08, Wis. Adm. Code, at least 180 days prior to this expiration date.

State of Wisconsin Department of Natural Resources For the Secretary

By _____
Bronke Yanke
Storm Water Specialist

_____
Date of Signature

EFFECTIVE DATE: **October 20, 2014** EXPIRATION DATE: **October 19, 2019**

Permit Conditions

Public Education/Outreach
(Not Included)

Public Involvement/Participation
(Not Included)

Illicit Discharge Detection & Elimination

Construction Site Pollutant Control (Erosion Control)

Post-Construction Stormwater Management

Pollution Prevention-Municipal Operations

Stormwater Quality Management

Storm Sewer System Map

Annual Report

Sheboygan County Stormwater Coalition Meetings

Updating Programs Via Task Order 18-01

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WI DNR Urban Nonpoint Source & Stormwater Grant

Project Cost	State Share (40.1%)	Local Share (59.9%)
$211,900	$85,000	$126,900

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Current/Updated Stormwater Program



- **Public Education/Outreach Involvement/Participation (NA)**
  - Sheboygan County Stormwater Coalition
- **Illicit Discharge Detection and Elimination (IDDE)**
  - Inspection at outfalls (100 annually, 12 every 5 years)
  - Track IDDE program activities for annual reporting
- **Construction Site Pollutant Control**
  - Ordinances/Admin: *Appendix D-Const. Site Inspections and Enforcement Procedures*
  - Revisions necessary due to NR 151 updates
  - Repeal existing and adopt new erosion control ordinance
- **Postconstruction Stormwater Management**
  - Ordinances/Admin: *Appendix E-Postconstruction SW Facilities-Long-Term Maintenance, Inspection and Enforcement Procedures*
  - Revisions necessary due to NR 151 updates
  - Repeal existing and adopt new post-construction stormwater ordinance
  - Initiate program to gather maintenance agreements for private BMPs
  - Initiate private BMPs maintenance program
- **Pollution Prevention – Municipal Operations**
  - Maintenance of municipally-owned stormwater BMPs : *Appendix E*
  - Track quantities of street sweeping, catch basin cleaning, deicer/anti-icing, leaf collection and staff training
  - Stormwater Pollution Prevention Plan (SWPPP) at Municipal Services Building
- **Stormwater Quality Management**
  - WinSLAMM Modeling and Alternatives Analysis
- **Storm Sewer System Map**
  - Update annually
- **Annual Report – March 31, annually**

City: 14 Wet Ponds
2 Dry Ponds
3 Vortech Units
Private: 1 Wet Pond

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Public and Private BMP Maintenance Programs

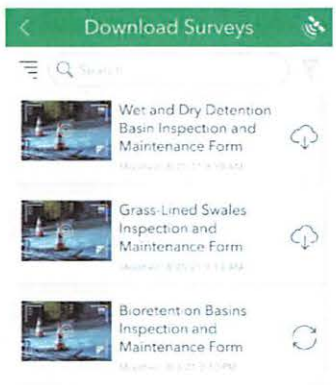
- **Every year:** Inspect per Appendix J-Stormwater Facility Maintenance Program and Appendix E using **GIS Tool**
  - Public BMPs: record inspection form by February 15 each year
  - Private BMPs: submit inspection form by February 15 each year

- **Every five years:** Provide certification by a qualified professional that the BMP is operating as designed
  - Public BMPs: City assess and record assessment
  - Private BMPs: Owner provides record to City

- If BMP not operating as designed, owner provides corrective maintenance plan
  - Routine maintenance within 2 months of assessment
  - Non-routine maintenance within 18 months of submittal of plan

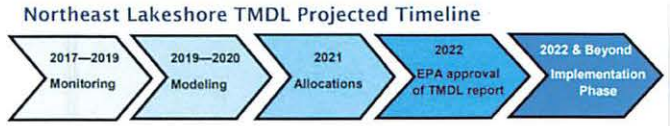
- Table 7.04-2: Stormwater Budget
  - City-owned wet ponds: Dredge one wet pond every 5 years (Project #1: dredging design in 2025 and dredging construction in 2026)

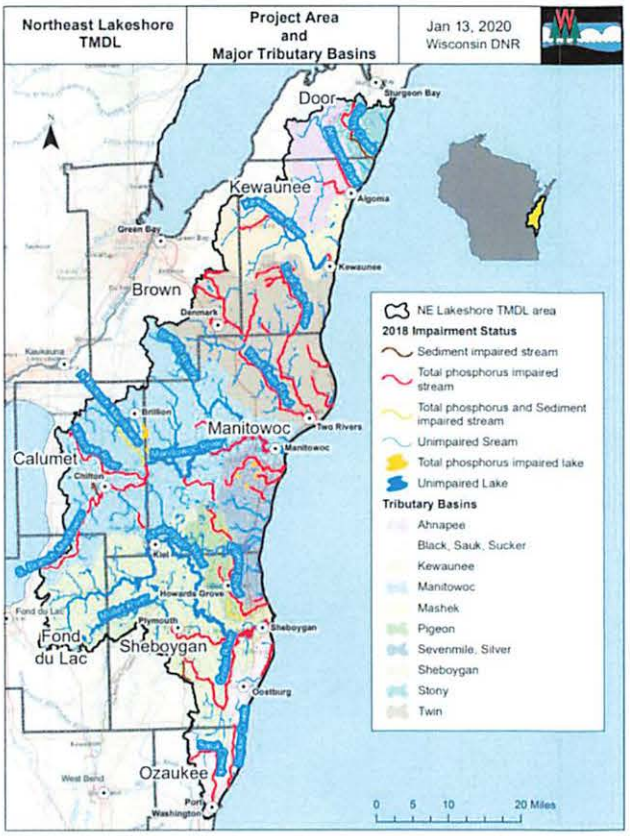


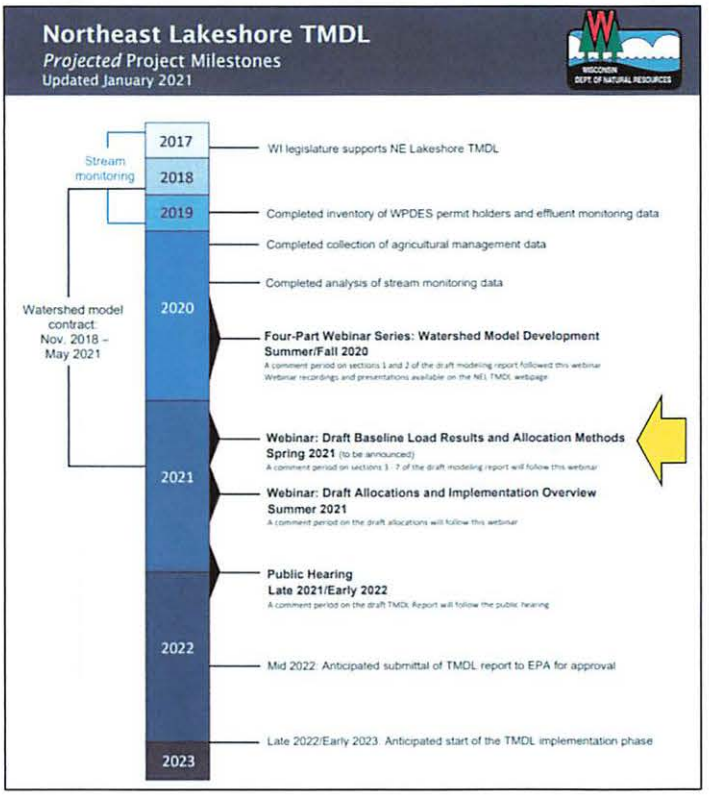


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Northeast Lakeshore TMDL

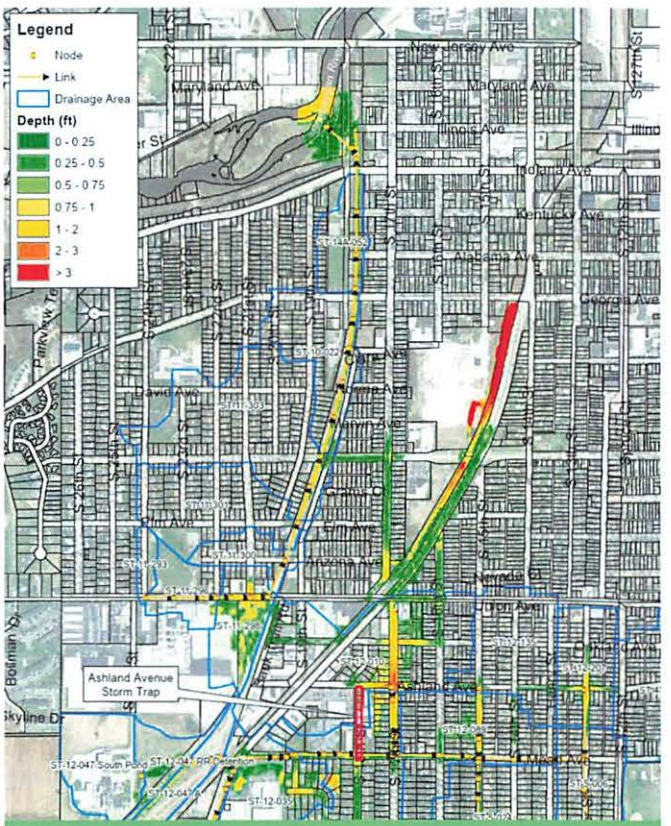




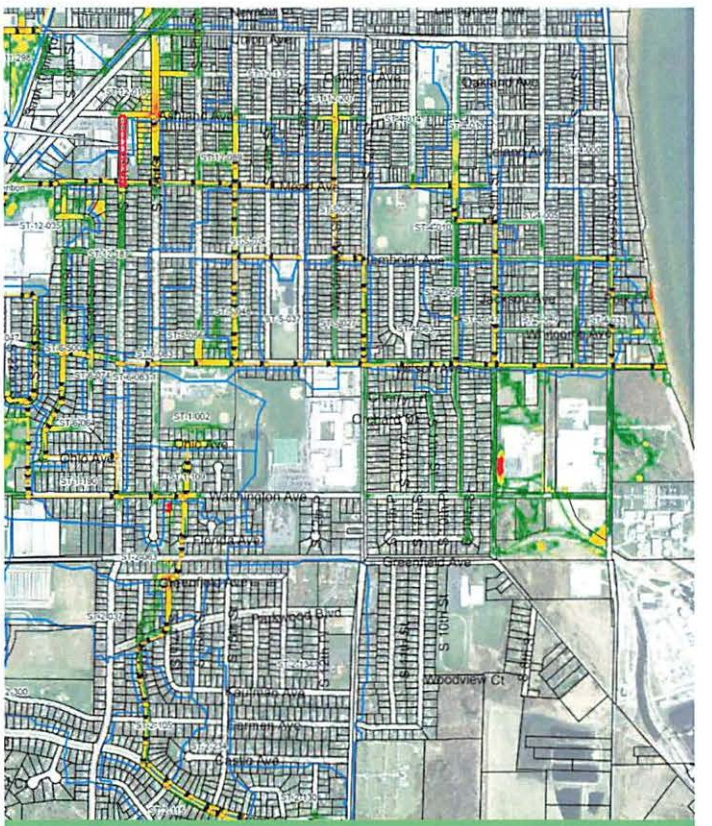


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Stormwater Quantity Modeling - (Existing Conditions)



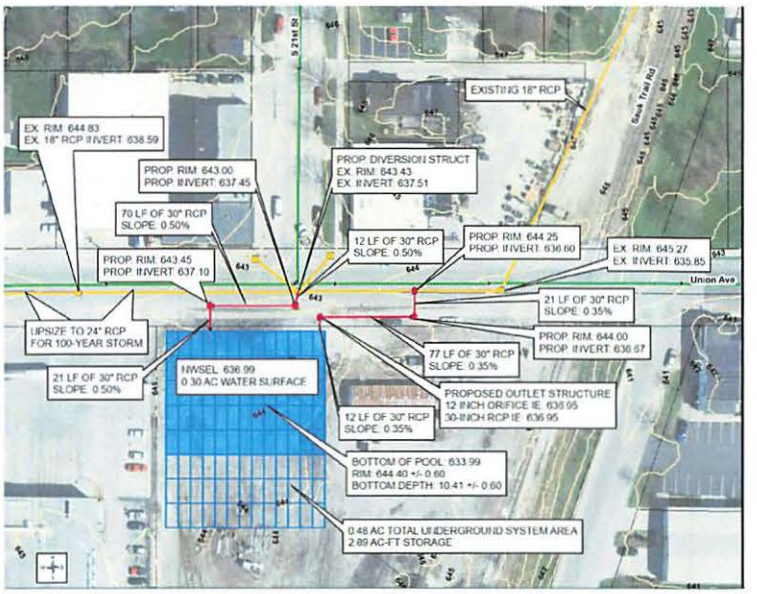
North Hot Spot Existing 100-year flood extents modeled in XPSWMM 2D



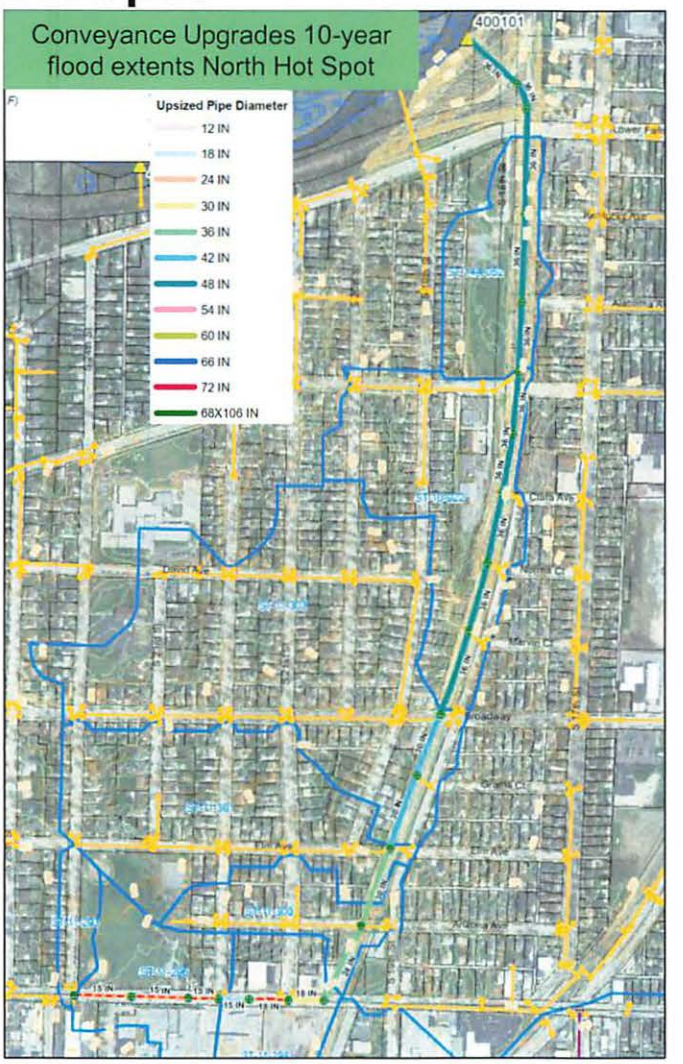
South Hot Spot Existing 100-year flood extents modeled in XPSWMM 2D

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Alternatives Analysis- Northern Hot Spot

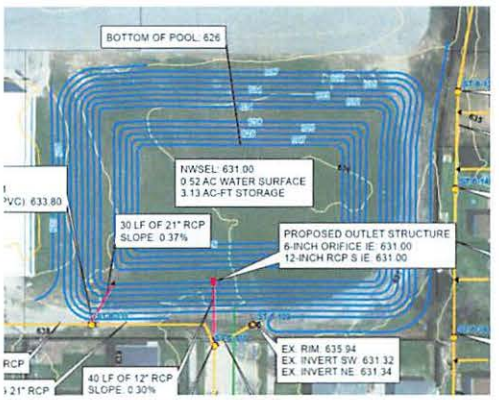


Union Street Rail Yard Proposed Underground Wet Pond

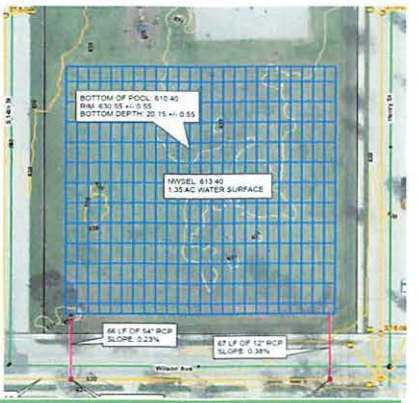


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Alternatives Analysis- Southern Hot Spot



Dollar Tree Wet Pond



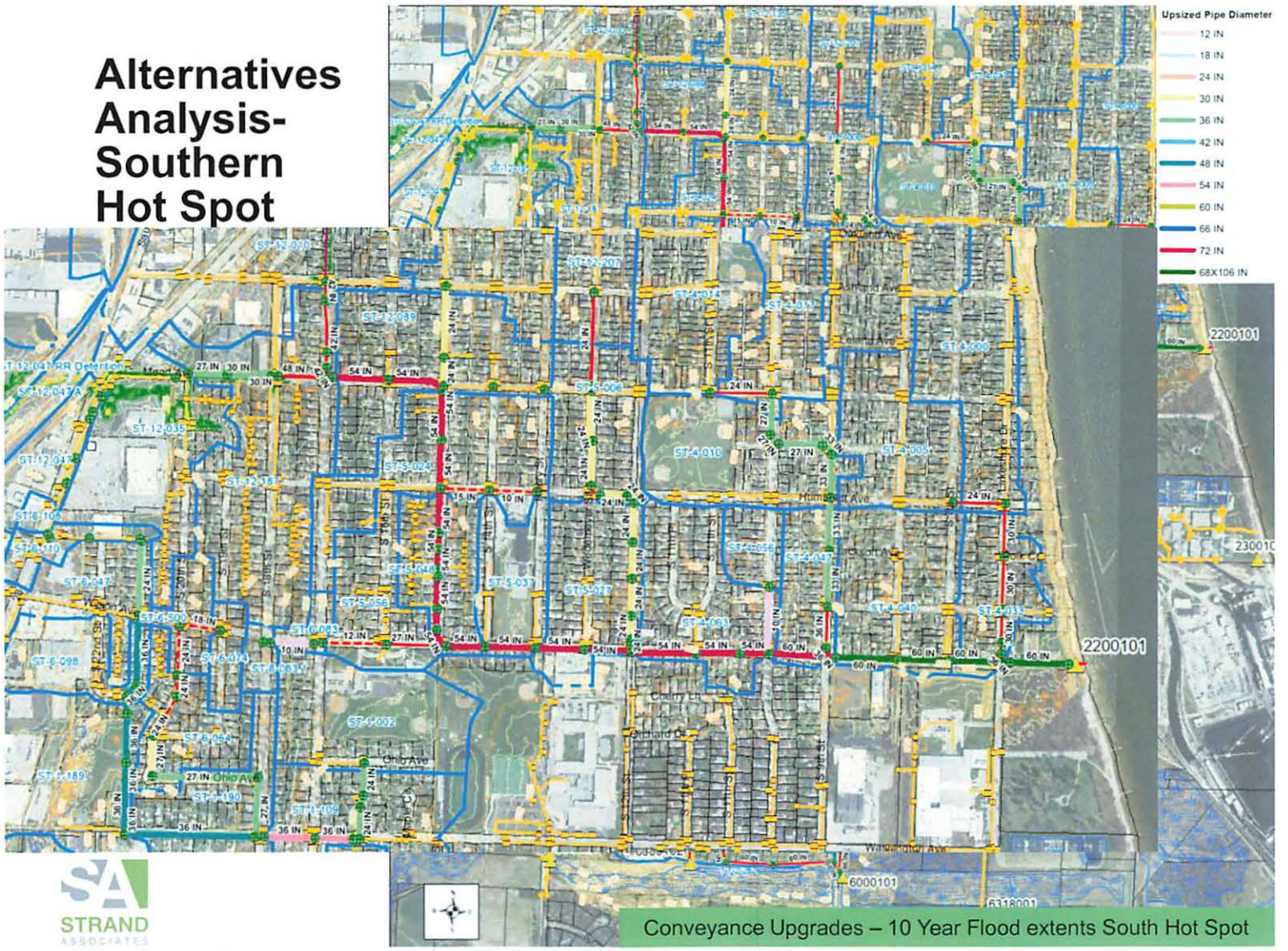
Wilson & 14th Street Proposed Underground Wet Pond



Wilson Avenue and 9th St Proposed Wet Pond

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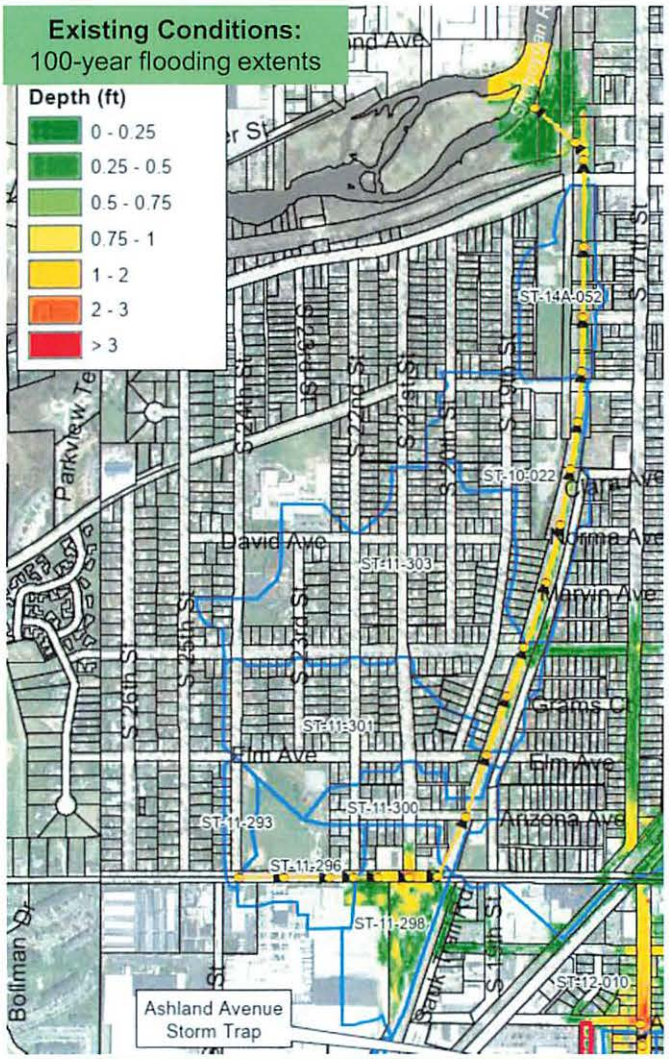
Alternatives Analysis- Southern Hot Spot

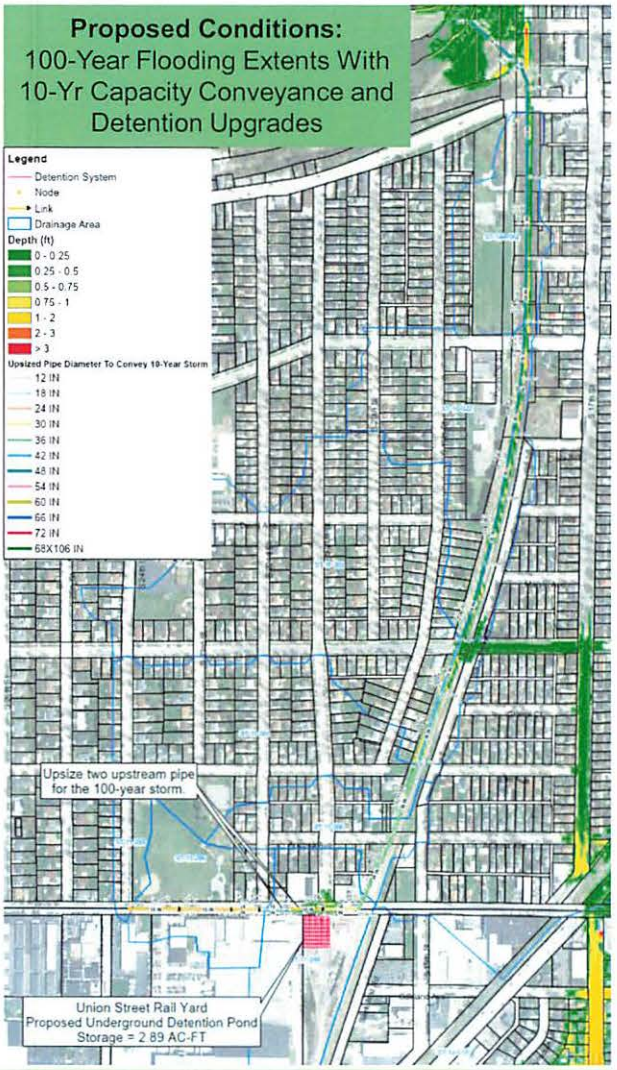


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Conveyance Upgrades – 10 Year Flood extents South Hot Spot

Alternatives Analysis: Performance North Hot Spot

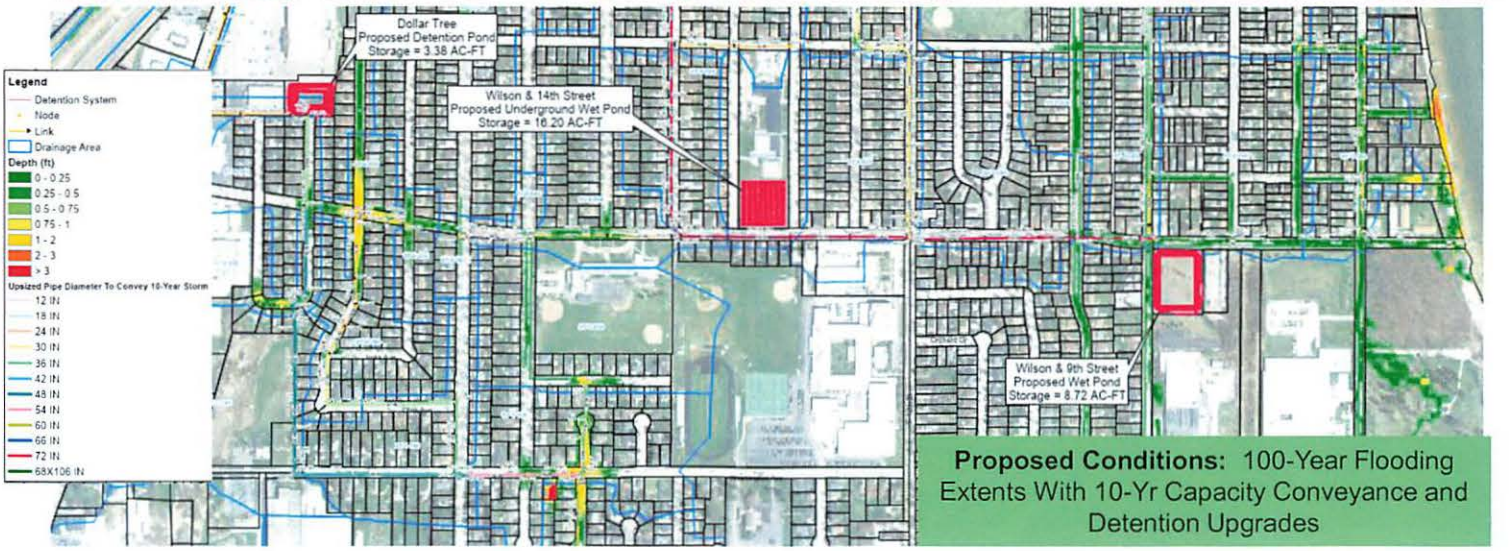




Alternatives Analysis: Performance South Hot Spot



Existing Conditions: 100-year flooding extents



Proposed Conditions: 100-Year Flooding Extents With 10-Yr Capacity Conveyance and Detention Upgrades

Alternatives Analysis- North and South Hot Spot: Cost

Alternative	OPCC
North Hot Spot Area Conveyance Upgrade for 10-Year Storm Sewer Capacity	$1,704,900
South Hot Spot Area Conveyance Upgrade for 10-Year Storm Sewer Capacity	$15,111,300

Table 6.06-1 Conveyance Upgrade Alternative Cost Comparison

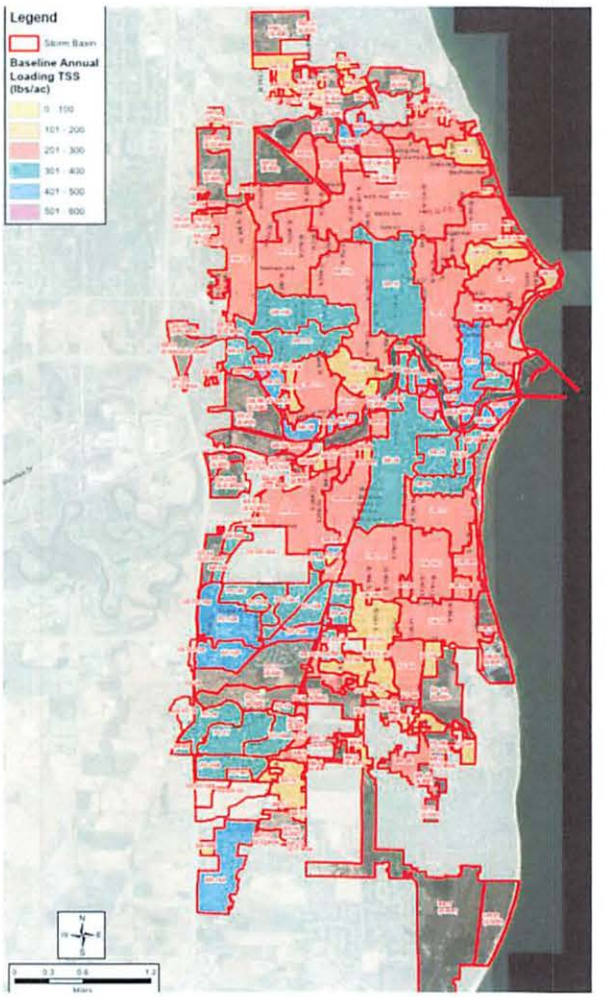
Alternative	Figure No.	OPCC
Union Avenue Underground Wet Detention Basin	O-10	$1,968,400
Dollar Tree Wet Detention Basin	O-7	$897,400
Wilson Avenue and 14th Street Underground Wet Detention Basin	O-12	$7,663,400
Wilson Avenue and 9th Street Wet Detention Basin	O-11	$1,506,100

Table 6.06-2 Conveyance Upgrade with Detention Alternative Cost Comparison

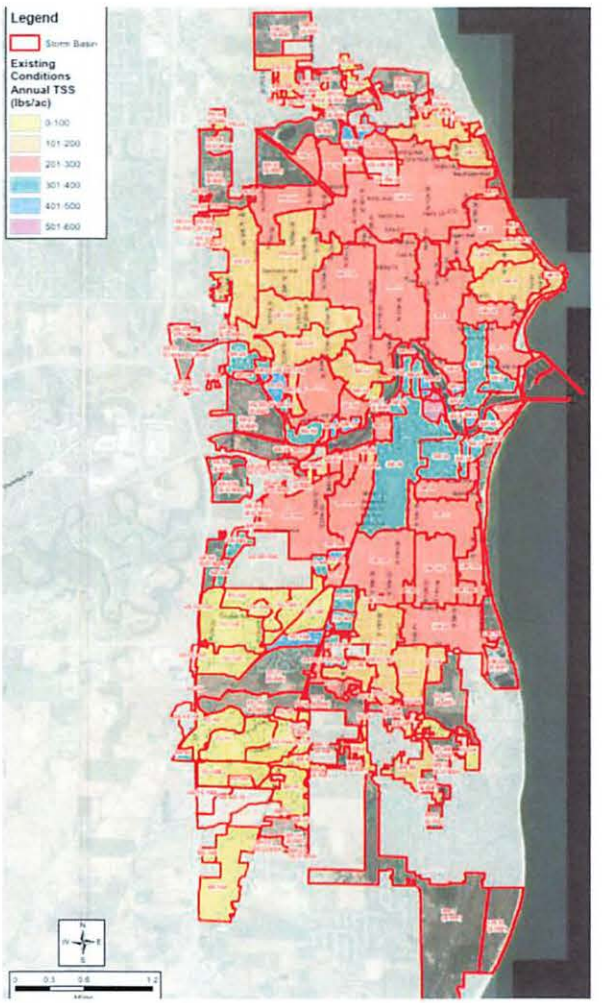
- Water Quality Benefit: Wet detention basins and underground wet ponds provide flood control and stormwater quality control.
- Other Considerations:
  - Evaluate if detention alone will provide sufficient improvement to help reduce flooding in the Hot Spot Areas.

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Stormwater Quality Modeling



Baseline Conditions/No Controls



Existing Conditions/With Controls

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Stormwater Quality Modeling

Pollutant	MS4 Permit Required Reductions	Northeast Lakeshore TMDL Required Reductions (Assumed)	MS4 Modeled Conditions Community-Wide (% Reduction)	TMDL Pollutant Reduction Gap (%)
TSS	20%	40%	LM: 5.4% FMC: 100.0% PR: 23.2% SR: 12.5% FC: 63.0% BR: 74.4% **Entire City: 25.5%**	LM: 34.6% FMC: -60.0% PR: 16.8% SR: 27.5% FC: -23.0% BR: -34.4% **Entire City: 14.5%**
TP	NA	27%	LM: 3.9% FMC: 100.0% PR: 20.9% SR: 9.2% FC: 44.9% BR: 67.2% **Entire City: 18.1%**	LM: 23.1% FMC: -73.0% PR: 6.1% SR: 17.8% FC: -17.9% BR: -40.2% **Entire City: 8.9%**

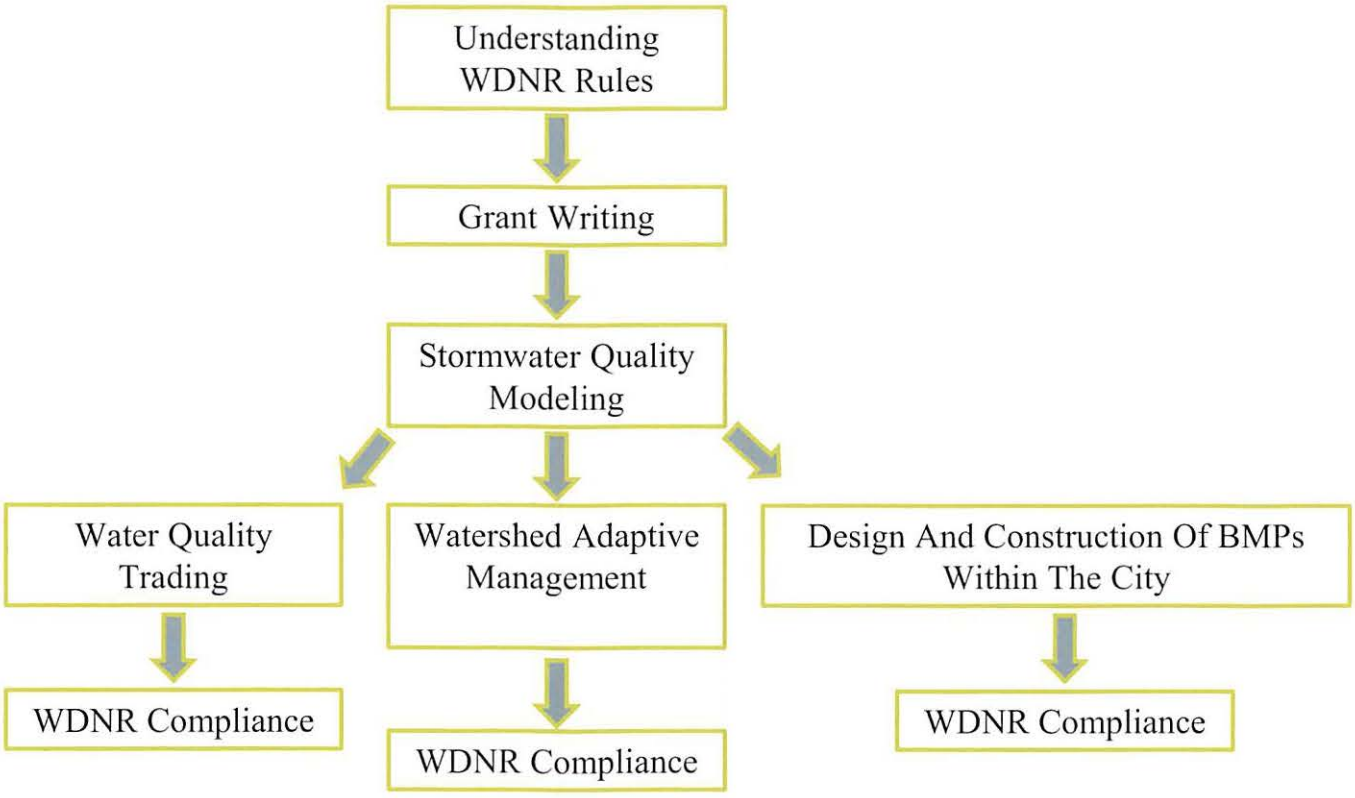
Note: Major River Basin Watershed/TMDL Reach Cross Reference: Lake Michigan (LM) = TMDL Reaches 315, 316 and 317, Fourmile Creek Tributary (FMC) = TMDL Reach 154, Pigeon River (PR) = TMDL Reaches 40, 238, and 239, Sheboygan River (SR) = TMDL Reaches 24 and 27, Fisherman's Creek (FC) = TMDL Reach 10, Black River (BR) = TMDL Reach 11. Given that the TMDL Reaches were not available at the start of this project, further breakdown of Major River Basin Watersheds into TMDL Reaches will be completed by the City after TMDL wasteload allocations are finalized as a separate, future City effort.

Table 4.06-5 MS4 Permit and Northeast Lakeshore TMDL (Assumed) Average Annual Percent Pollutant Reductions and Pollutant Reduction Gap Per Watershed

Pollutant	MS4 Permit Required Reductions (percent)	Northeast Lakeshore TMDL Assumed Required Reductions (percent)	MS4 Existing Conditions Reductions (percent)	TMDL Pollutant Reduction Gap (percent)	Annual TMDL Pollutant Reduction Gap (lbs)
TSS	20	40	25.5	14.5	306,668
TP	NA	27	18.1	8.9	500.5

Table 5.01-1 Required and Existing Conditions Pollutant Reductions per Northeast Lakeshore River TMDL (Assumed)

Alternatives Analysis



MS4 Achieves 20% TSS Reduction and is Allowed to do Water Quality Trading

Must be in jurisdiction of WWTP (NR 217)

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BMPs in the City (Alternative #1)

Structural BMPs



2nd Creek dry to wet pond conversion (27.8 lbs TP)



Geele and Taylor wet detention basin (42.9 lbs. TP)

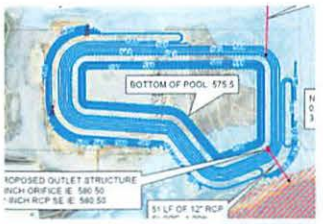


Polarware Site Wet Pond(81 lbs. TP)

Non-Structural BMPs



Vacuum Street Sweeping: Change from monthly to once every 2 weeks (78.1 lbs. TP)



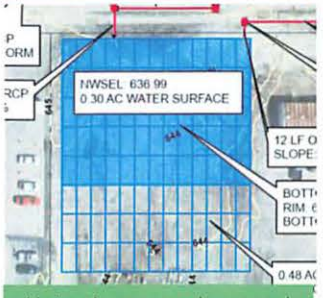
20th St Wet Pond (15.3 lbs. TP)



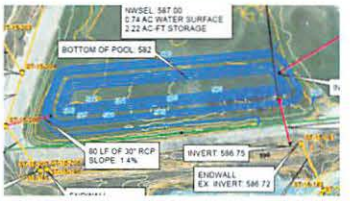
Wilson Avenue and 9th Street Wet Detention Basin (105.8 lbs. TP)



Greenfield & 9th Wet Pond (46.5 lbs TP)



Union Avenue underground wet detention basin (7.3 lbs. TP)



WPS Wet Pond (18.3 lbs TP)

20 Years Redevelopment @ 40% TSS (67.5 lbs TP)

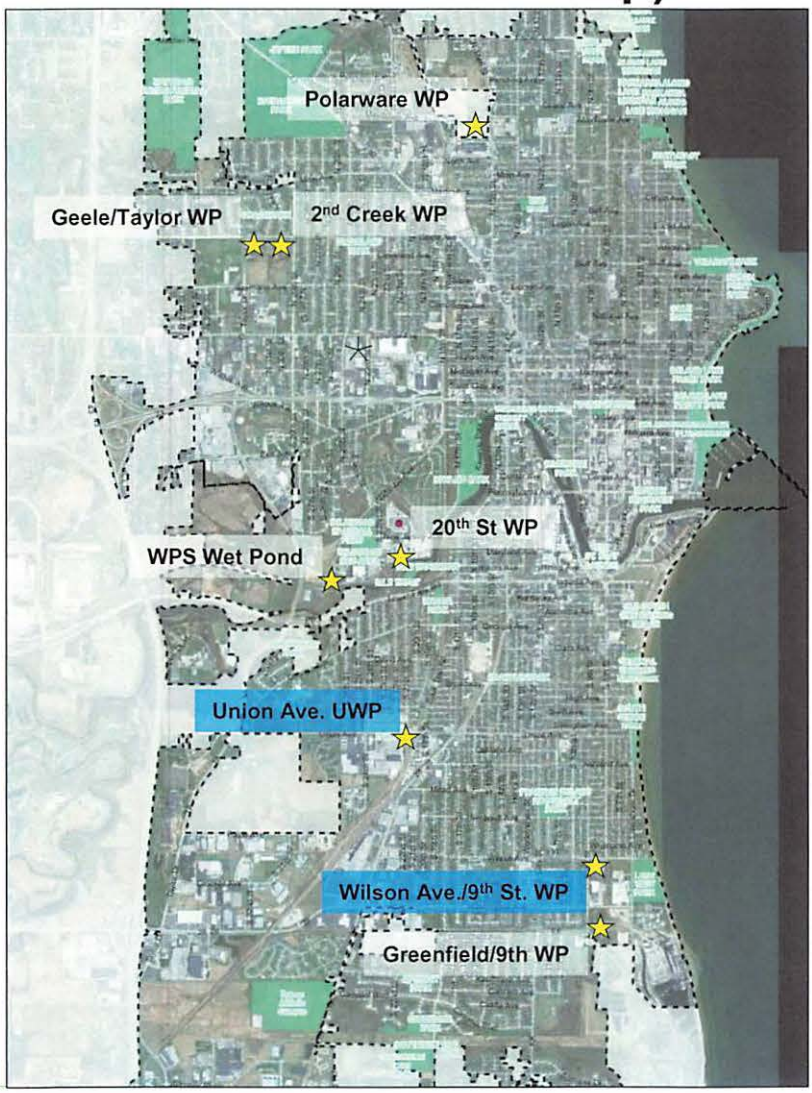
Water Quality Trading



Example Buffer Strip

Agricultural Water Quality Trading (10 lbs TP)

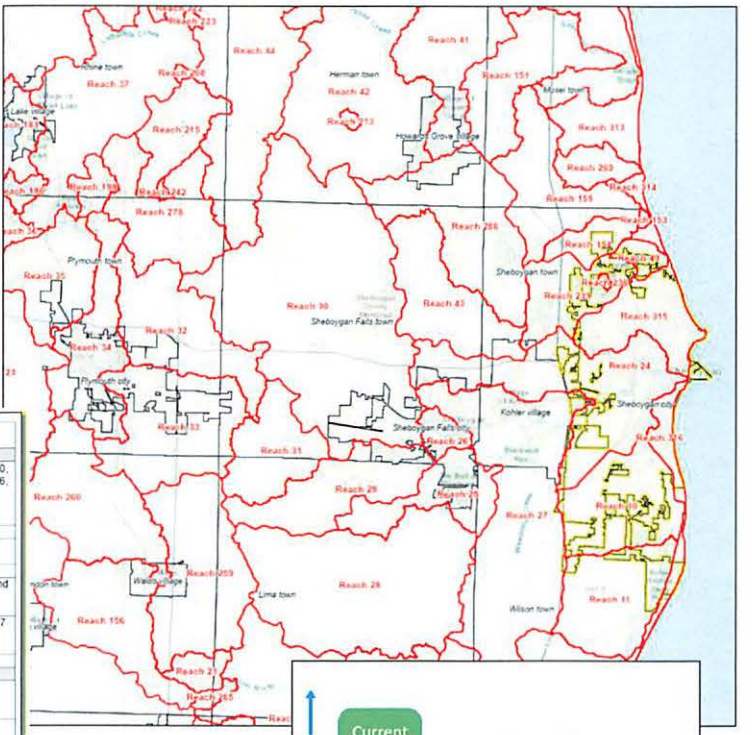
BMPs in the City (Alternative #1-Structural BMPs Map)



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Water Quality Trading

- Agricultural Land
- Other MS4s / WWTFs / Private Point Dischargers
- Wisconsin Act 151 (2020) created framework for third-party clearinghouse
- Cost Range: $125-$150/lb TP NPW



Facility	HUC-12	Available TSS or TP for WQT (lbs)	Reachshed
		MS4s	
Sheboygan County	040301011109 040301010804 040301010705 040301011201 040301011202	To Be Determined	Reach 10, 11, 24, 27, 40, 154, 238, 239, 315, 316, and 317
City of Sheboygan Falls	040301011109	To Be Determined	Reach 24 and 27
Village of Kohler	040301011109 040301010804	To Be Determined	Reach 24, 27, and 239
Village of Howards Grove	040301010804	To Be Determined	
Town of Sheboygan	040301010804 040301010705 040301011109	To Be Determined	Reach 24, 154, 239, and 315
Town of Wilson	040301011109 040301011201 040301011202	To Be Determined	Reach 10, 11, 24, and 27
Town of Taycheedah	040301011101	To Be Determined	Reach 272 and 273
		WWTPs	
Sheboygan Regional Wastewater Treatment Facility	040301011109	To Be Determined	Reach 316
Northern Moraine Utility Wastewater Treatment Plant		To Be Determined	
Plymouth Wastewater Treatment Facility		To Be Determined	
Kiel Wastewater Treatment Facility		To Be Determined	
Belgium Wastewater Treatment Plant		To Be Determined	
Waldo Wastewater Treatment Plant		To Be Determined	
Howards Grove Wastewater Treatment Facility		To Be Determined	
		Private Point Dischargers	
See Table 6 in the draft NE TMDL: Swat Model Setup, Calibration, and Validation document published March 15, 2021, for a listing of potential Confined Animal Feeding Operations	Varies	To Be Determined	Varies
See Table 4 in the draft NE TMDL: Swat Model Setup, Calibration, and Validation document published March 15, 2021, for a listing of private point dischargers	Varies	To Be Determined	Varies

Table 5.06-1 Potential Trading Partners

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Watershed Adaptive Management

- Point and nonpoint sources work collaboratively in protecting and restoring local water resources.
- One or more local WWTFs must initiate.
- Involves agricultural BMPs like water quality trading.
- WWTF gets less restrictive interim phosphorus limits while pursuing WAM.
- WAM can extend over a 15-year timeframe (up to three 5-year permit terms).
- Benefits:
  - Improved lake and stream water quality with compliance at lower overall cost, typically in the $62 to $125/lb TP range. Assumes cost share dollars available and counties provide technical/outreach assistance.
  - Significantly delaying or eliminating effective date of stringent effluent phosphorus limits at WWTFs.
- Difference Between WQT and WAM:
  - WQT requires trade ratios, WAM doesn't
  - WQT requires credit thresholds, WAM doesn't
  - WAM requires in-stream water quality monitoring, WQT doesn't
  - WAM must be initiated by WWTF, WQT doesn't
- No current WAM effort in Sheboygan County

Yahara WINs

Yahara WINs Buy-In: $50/lb TP for MS4s
Madison Met.: Administers Program
Dane County: Broker for Ag BMPs with Farmers
USGS: Provides Water Quality Monitoring

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Alternatives Analysis

Alternative #	Total 20-Year NPW	$/lb TP Removed (20-year NPW)
1 - 8 Structural BMPs + Non-Structural BMPs + WQT	$22.8 million	$2,280
2 - 7 Structural BMPs + Non-Structural BMPs + WQT	$29.4 million	$2,941
3 - 4 Structural BMPs + Higher Level Non-Structural BMPs + WQT	$28.3 million	$2,825

Alternative	Structural BMPs	Non-Structural BMP: 40% TSS Requirement for Redevelopment	Non-Structural BMP: 80% TSS Requirement for Redevelopment	Non-Structural BMP: Increased Street Sweeping Frequency (1 Pass Every 2 Weeks)	Non-Structural BMP: Increased Street Sweeping Frequency (1 Pass Every Week)	WQT with Agricultural Lands
1	8	Yes	No	Yes	No	Yes
2	7	Yes	No	Yes	No	Yes
3	4	No	Yes	No	Yes	Yes

Note: See Table 5.04-1 for detailed alternatives analysis information.

Table 5.02-1 Alternatives Analysis Summary of Components

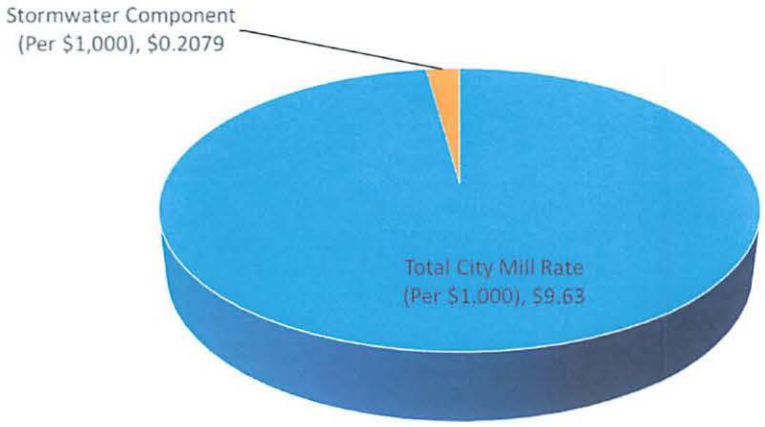
Concept-Level Stormwater Utility Feasibility Study

- Stormwater Utility Basics
- Potential Stormwater Utility Budget
- Potential Stormwater Utility Next Steps
- Stormwater Utility Benefits
- Implications of MS4 Non-Compliance

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Stormwater Utility Basics

- Current Stormwater "Charges" Are Based on Assessed Property Value



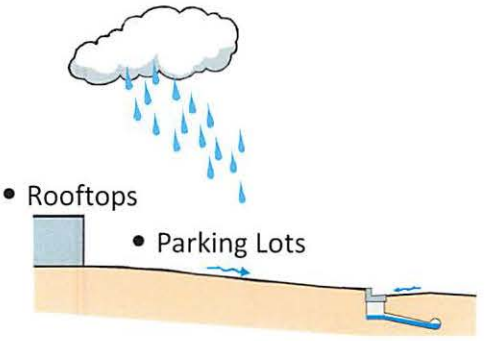
- Stormwater Budget = $548,000
- Property assessed at $100,000 currently pays approx. $20 per yr.

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Stormwater Utility Basics

- Developed Land is Primary Urban Source of Stormwater Runoff

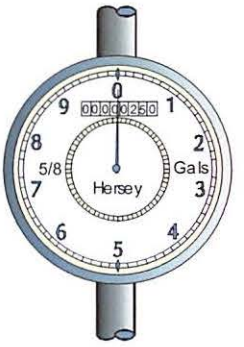




Undeveloped Land
Grass Field
Lawns

Developed Land
Rooftops
Parking Lots
Sidewalks
Compacted Gravel

- Rate Structure Based on Impervious Area





Water Utility - Meter Reading

Stormwater Utility - Impervious Area

STRAND ASSOCIATES

Stormwater Utility Basics

- Stormwater Fee Seen As Fair and Equitable Based on Runoff from Impervious Area
  - Example: Equivalent Runoff Unit (ERU) Rate Methodology

Example Single-Family Residential Property

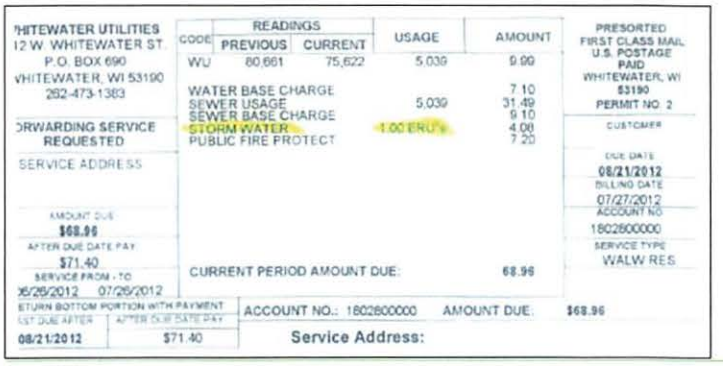


3,100 sq. ft.
= 1.0 ERU

Example Non-Residential Property



Measured Impervious Area
= 1,440,000 sq. ft.
= 465 ERUs
(1,440,000/3,100)



'HITEWATER UTILITIES
12 W. WHITEWATER ST.
P.O. BOX 690
VHITEWATER, WI 53190
262-473-1383

ORWARDING SERVICE REQUESTED

SERVICE ADDRESS

AMOUNT DUE
$68.96
AFTER DUE DATE PAY
$71.40
SERVICE FROM - TO
6/26/2012 07/25/2012

CODE	READINGS PREVIOUS	CURRENT	USAGE	AMOUNT
WU	80,661	75,622	5.039	9.99
WATER BASE CHARGE				7.10
SEWER USAGE			5.039	31.49
SEWER BASE CHARGE				9.10
STORM WATER			1.00 ERU's	4.00
PUBLIC FIRE PROTECT				7.20
CURRENT PERIOD AMOUNT DUE:				68.96

PRESORTED
FIRST CLASS MAIL
U.S. POSTAGE
PAID
WHITEWATER, WI
53190
PERMIT NO. 2

CUSTOMER

DUE DATE
08/21/2012
BILLING DATE
07/27/2012
ACCOUNT NO
1802600000
SERVICE TYPE
WALW RES

RETURN BOTTOM PORTION WITH PAYMENT
ST DUE AFTER | AFTER DUE DATE PAY
08/21/2012 | $71.40

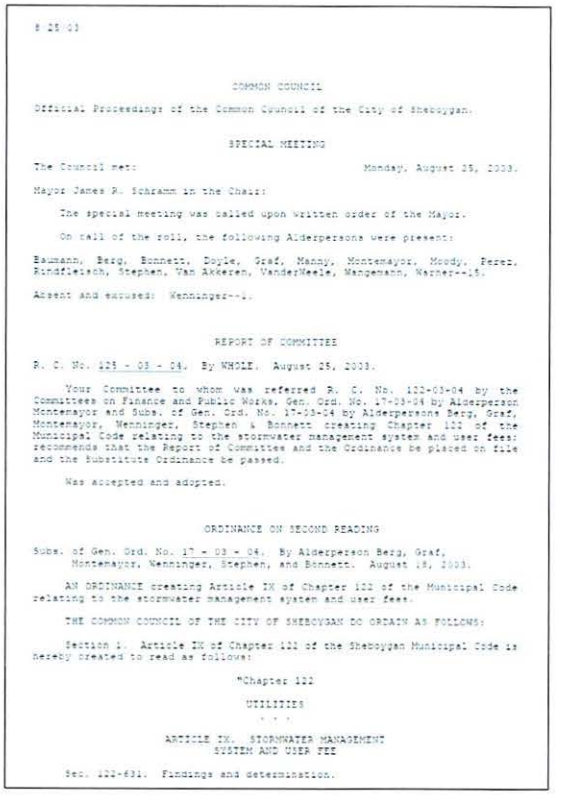
ACCOUNT NO.: 1802600000 AMOUNT DUE: $68.96

Service Address:

Stormwater Utility Basics

- **City of Sheboygan Stormwater Utility History**
  - Stormwater Utility Adopted in 2003
  - Stormwater Utility Charged Fees in 2004 and 2005 (approx. $36.00 per ERU)
  - Stormwater Utility Stopped Charging Fees in 2006
- **2021 Concept-Level Stormwater Utility Feasibility Study**
  - 2,470 sf per ERU
  - 49,683 ERUs
  - Budget Range (2020-2046) = $550,000 to $3.7 million
  - ERU Cost Range (2020-2046) = $11 to $58/yr
- **Wisconsin Stormwater Utilities**
  - 123 Existing Stormwater Utilities
  - 2021 Statewide Average:
    - $5.45/month
    - $71.45/year (range: $11 - $210/year)

STRAND ASSOCIATES



8 25 03

COMMON COUNCIL

Official Proceedings of the Common Council of the City of Sheboygan.

SPECIAL MEETING

The Council met: Monday, August 25, 2003.

Mayor James R. Schramm in the Chair.

The special meeting was called upon written order of the Mayor.

On call of the roll, the following Aldermpersons were present:

Baumann, Berg, Bonnett, Doyle, Graf, Manny, Montemayor, Moody, Perez, Rindfleisch, Stephen, Van Akkeren, VanderWeele, Wangemann, Warner--15.

Absent and excused: Kenninger--1.

REPORT OF COMMITTEE

R. C. No. 125 - 03 - 04. By WHOLE. August 25, 2003.

Your Committee to whom was referred R. C. No. 122-03-04 by the Committees on Finance and Public Works, Gen. Ord. No. 17-03-04 by Alderperson Montemayor and Subs. of Gen. Ord. No. 17-03-04 by Alderpersons Berg, Graf, Montemayor, Wenninger, Stephen & Bonnett creating Chapter 122 of the Municipal Code relating to the stormwater management system and user fees: recommends that the Report of Committee and the Ordinance be placed on file and the Substitute Ordinance be passed.

Was accepted and adopted.

ORDINANCE ON SECOND READING

Subs. of Gen. Ord. No. 17 - 03 - 04. By Alderperson Berg, Graf, Montemayor, Wenninger, Stephen, and Bonnett. August 18, 2003.

AN ORDINANCE creating Article IX of Chapter 122 of the Municipal Code relating to the stormwater management system and user fees.

THE COMMON COUNCIL OF THE CITY OF SHEBOYGAN DO ORDAIN AS FOLLOWS:

Section 1. Article IX of Chapter 122 of the Sheboygan Municipal Code is hereby created to read as follows:

"Chapter 122

UTILITIES

. . .

ARTICLE IX. STORMWATER MANAGEMENT SYSTEM AND USER FEE

Sec. 122-631. Findings and determination.

FOX-WOLF

WI Stormwater User Charge System Information

Representative Wisconsin Communities

Stormwater user charge information changes often!

Contact individual communities to confirm accuracy.

APWA

03/04/21

	Name of Community or Stormwater District	Population (2013)	Created	ERU Size (sf)	Annual $/ERU or 1 fam home	Credit Policy? Y/N	Credit Policy? Max Amount	Web site addresses
1	**Allouez** (Village)	13,896	2004	3,333	$ 90.00	N		www.villageofallouez.com
2	**Altoona** (City)	7,056	2007		$ 36.00	Y	75%	www.ci.altoona.wi.us
3	**Antigo** (City)	8,004	2010	3,069	$ 42.24	Y	50%	www.antigo-city.org
4	**Appleton** (City)	74,370	1995	2,368	$ 175.00	Y	73%	www.appleton.org
5	**Ashwaubenon** (Village)	17,274	2012	3,316	$ 50.00	Y	50%	www.Ashwaubenon.com
6	**Baraboo** (City)	12,100	2005	2,379	$ 49.24	N		www.cityofbaraboo.com
7	**Barron** (City)	3,371	2006	10,850	$ 24.00	Y	75%	www.barronwi.us
8	**Bayside** (Village)	4,418	2009	5,269	$ 154.00	N		www.bayside-wi.gov
9	**Beaver Dam** (City)	16,345	2008	2,637	$ 48.61	Y	33%	www.cityofbeaverdam.com
10	**Belleville** (Village)	2,426	2010	2,800	$ 50.04	Y	50%	www.bellevillewi.org
11	**Bellevue** (Village)	14,570	2002	3,221	$ 48.00	Y	100%	www.bellevue-wi.com
12	**Beloit** (City)	36,888	2006	3,347	$ 42.00	Y	90%	www.beloitwi.gov

Stormwater Utility Budget (See Table 7.04-2)

Activity	Permit Deadlines		Current Status						
	Planning	Implementation	Planning	Implementation	2020	2021	2022	2023	2024	2025
Public Education/Outreach	31-Mar-21									
Overall Public Involvement and Participation Program Costs from MS4 Annual Report (2020: $9,000, 2021 Budget: $19,000)			In Report	2021	$ 9,000	$ 19,000	$ 19,570	$ 20,157	$ 20,762	$ 21,385
					$ 9,000	**$ 19,000**	**$ 19,570**	**$ 20,157**	**$ 20,762**	**$ 21,385**
Public Involvement/Participation	31-Mar-21									
Overall Public Involvement and Participation Program Costs from MS4 Annual Report (2020: $5,000, 2021 Budget: $11,000)			In Report	On-going	$ 5,000	$ 11,000	$ 11,330	$ 11,670	$ 12,020	$ 12,381
					$ 5,000	**$ 11,000**	**$ 11,330**	**$ 11,670**	**$ 12,020**	**$ 12,381**
Illicit Discharge Detection Program	31-Mar-21									
Administration of IDDE Program			In Report	2021	$ 1,000	$ 1,030	$ 1,061	$ 1,500	$ 1,545	$ 1,591
Perform IDDE Inspections (Existing 49 Outfalls Per Year; Proposed: 100 Outfalls Annually & 112 Every 5 Years) & Program Annually			In Report	On-going	$ 14,700	$ 16,661	$ 33,322	$ 34,322	$ 35,351	$ 36,412
ArcGIS Online Subscription for ArcGIS Collector App			In Report	14-Jul-05			$ 500	$ 515	$ 530	$ 546
Track IDDE Activities for Annual Report			In Report	On-going	$ 300	$ 309	$ 318	$ 500	$ 515	$ 530
					$ 16,000	**$ 18,000**	**$ 35,201**	**$ 36,837**	**$ 37,942**	**$ 39,080**
Construction Site Erosion Control	31-Mar-21									
Overall Construction Site Erosion Control Program Costs from MS4 Annual Report (2020: $20,000, 2021 Budget: $22,000)			In Report	2021	$ 16,000	$ 17,880	$ 18,416	$ 18,969	$ 19,538	$ 20,124
Work with Village Attorney to Adopt Updated Construction Site Erosion and Sediment Control Ordinance			In Report	2021	$ -	$ -	$ 1,000	$ -	$ -	$ -
Continue Administration of Ordinance			In Report	On-going	$ 3,000	$ 3,090	$ 3,183	$ 3,278	$ 3,377	$ 3,478
Track Ordinance-Related Activities (Permits Issued, Enforcement Actions) for Annual Report			In Report	On-going	$ 1,000	$ 1,030	$ 1,061	$ 1,093	$ 1,126	$ 1,159
					$ 20,000	**$ 22,000**	**$ 23,660**	**$ 23,340**	**$ 24,040**	**$ 24,761**
Postconstruction Stormwater Mgmt	31-Mar-21									
Overall Post Construction Program Costs from MS4 Annual Report (2020: $25,000, 2021 Budget: $28,000)			In Report	2021	$ 21,000	$ 23,880	$ 24,596	$ 25,334	$ 26,094	$ 26,877
Work with Village Attorney to Adopt Updated Postconstruction Stormwater Management Ordinance			In Report	2021	$ -	$ -	$ 1,000	$ -	$ -	$ -
Continue Administration of Ordinance			In Report	On-going	$ 3,000	$ 3,090	$ 3,183	$ 3,278	$ 3,377	$ 3,478
Initiate Private BMP Maintenance Program per Appendix G and H of the Village Erosion Control and Stormwater Management Reference Document			In Report	2021	$ -	$ -	$ 1,000	$ 1,030	$ 1,061	$ 1,093
Initiate Program to Gather or Obtain Retroactively Maintenance Agreements for Private BMPs			In Report	2021			$ 1,000	$ 1,030	$ 1,061	$ 1,093
Track Ordinance-Related Activities (Permits Issued, Enforcement Actions) for Annual Report			In Report	On-going	$ 1,000	$ 1,030	$ 1,061	$ 1,093	$ 1,126	$ 1,159
					$ 25,000	**$ 28,000**	**$ 31,840**	**$ 31,765**	**$ 32,718**	**$ 33,700**
Pollution Prevention Program and Operation and Maintenance	31-Mar-21									
Overall Pollution Prevention Program Costs from MS4 Annual Report (2020: $350,000, 2021 Budget: $360,000)			In Report	On-going	$ 346,000	$ 375,880	$ 387,156	$ 398,771	$ 410,734	$ 423,056
Initiate Public BMP Maintenance Program per Appendix E of the City Erosion Control and Stormwater Management Reference Guide			In Report	2021	$ -	$ -	$ 1,000	$ 1,030	$ 1,061	$ 1,093
Assessment of City's stormwater BMPs for Necessary Routine Maintenance per Appendix E of the City Erosion Control and Stormwater Management Reference Guide: Once per Year			In Report	2021	$ -	$ -	$ 1,500	$ 1,545	$ 1,591	$ 1,639
Assessment of City's stormwaer BMPs for Necessary Non-Routine Maintenance per Appendix E of the City Erosion Control and Stormwater Management Reference Guide: Once every 5 years			In Report	2021	$ -	$ -	$ -	$ -	$ 30,000	$ -
Design of City-Owned Stormwater BMP Non-Routine Maintenance	**2021 Cost:**	$ 183,750			$ -	$ -	$ -	$ -	$ -	$ 90,000
City-Owned Stormwater BMP Non-Routine Mainenance (Project#1-2026)	$ 213,017				$ -	$ -	$ -	$ -	$ -	$ -
City-Owned Stormwater BMP Non-Routine Mainenance (Project#2-2031)	$ 246,945				$ -	$ -	$ -	$ -	$ -	$ -
City-Owned Stormwater BMP Non-Routine Mainenance (Project#3-2036)	$ 286,277				$ -	$ -	$ -	$ -	$ -	$ -
City-Owned Stormwater BMP Non-Routine Mainenance (Project#4-2041)	$ 331,873				$ -	$ -	$ -	$ -	$ -	$ -
City-Owned Stormwater BMP Non-Routine Mainenance (Project#5-2046)	$ 384,732				$ -	$ -	$ -	$ -	$ -	$ -
SWPPP-Install Perimeter Sediment Control Devices, Inlet Filters, and Spill Kit at Municipal Services Building			In Report	2022	$ -	$ -	$ 2,300	$ -	$ -	$ -
Apply for WDNR UNPS Grant for Hydrodynamic Separator at Public Works Garage	**2021 Cost:**		In Report	2022	$ -	$ -	$ 7,000	$ -	$ -	$ -
Design (2023) and Construct (2024) HDS at Public Works Garage	$ 120,000							$ 20,000	$ 10,081	$ 10,081
UNPS Grant for HDS									$ (75,564)	
Investigate Options for Roof Over Fueling Area at Municipal Services Building			In Report	2022	$ -	$ -	$ 7,500	$ -	$ -	$ -
Deicing and Snow Removal Operations Admin/Tracking			In Report	On-going	$ 1,000	$ 1,030	$ 1,061	$ 1,093	$ 1,126	$ 1,159
Leaf and Grass Clipping Management			In Report	On-going	$ 1,000	$ 1,030	$ 1,061	$ 1,093	$ 1,126	$ 1,159
Stormwater Pollution Prevention Training for City staff			In Report	On-going	$ 1,000	$ 1,030	$ 1,061	$ 1,093	$ 1,126	$ 1,159
Track Pollution Prevention Activities for Annual Report			In Report	On-going	$ 1,000	$ 1,030	$ 1,061	$ 1,093	$ 1,126	$ 1,159
					$ 350,000	**$ 380,000**	**$ 410,700**	**$ 425,717**	**$ 382,405**	**$ 530,506**

STRAND ASSOCIATES

Stormwater Utility Budget (see Table 7.04-2)

Stormwater Quality Management	31-Mar-21									
Overall Stormwater Quality Management Program Costs from MS4 Annual Report (2020: $30,000, 2021 Budget: $35,000)			In Report	In-Compliance	$ 30,000	$ 35,000	$ 36,050	$ 37,132	$ 38,245	$ 39,393
Stormwater Quality Management Plan Update			In Report	In-Compliance	$ 105,590	$ 105,590	$ -	$ -	$ -	$ -
UNPS Planning Grant Funding Stormwater Quality Management Plan Update					$ (42,500)	$ (42,500)				
TP Credit for Leaf Management Program Analysis								$ 35,000		
WDNR UNPS Grant Application for WinSLAMM Modeling Update					$ -	$ -	$ -	$ -	$ -	$ 8,296
WDNR UNPS Grant for WinSLAMM Modeling Update					$ -	$ -	$ -	$ -	$ -	$ -
WinSLAMM Modeling Update					$ -	$ -	$ -	$ -	$ -	$ -
WDNR UNPS Grant Application for High-Efficiency Street Sweeper Purchase				2024					$ 7,293	
High-Efficiency Street Sweeper Purchase			In Report	2025	$ -	$ -	$ -	$ -	$ -	$ 352,193
UNPS Grant for High-Efficiency Street Sweeper	**2021 Cost**		In Report	2025	$ -	$ -	$ -	$ -	$ -	$ (39,102)
Enhanced Street Sweeper Program (1/4 in 2023, 1/2 in 2025, 3/4 in 2027, All in 2029)	$ 405,413		In Report	2022	$ -	$ -	$ -	$ 107,526	$ 110,752	$ 228,148
Modeling of Private BMPs for Inclusion in Existing Conditions Pollutant Reduction			In Report	On-going	$ -	$ -	$ 2,000	$ 2,060	$ 2,122	$ 2,185
Enhanced Leaf Collection Program to Meet TP Credit Criteria			In Report	2022	$ -	$ -	$ -	$ -	$ 60,000	$ 61,800
WDNR Municipal Flood Control Grant Application for Design/Construction of Stormwater BMPs									$ 7,293	
WDNR UNPS Grant Application for Design/Construction of Stormwater BMPs				On-going	$ 6,000	$ -	$ -	$ -	$ 7,293	$ -
WDNR UNPS Grant for Stormwater BMP	**2021 Cost**	**TMDL Reach**			$ -	$ -	$ (150,000)	$ -	$ -	$ -
Implementation of BMPs Identified in Alternative 1:			In Report							
Design/Construct 2nd Creek Dry to Wet Pond Conversion	$ 896,820	239 (Pigeon River)	In Report	2022	$ -	$ -	$ 71,012	$ 71,012	$ 71,012	$ 71,012
Design/Construct Wilson and 9th Wet Detention Basin	$ 1,506,060	316 (Lake Michigan)	In Report	2026	$ -	$ -	$ -	$ -	$ -	$ -
Design/Construct Union Street Underground Wet Detention Basin	$ 1,968,373	24 (Sheboygan River)	In Report	2030	$ -	$ -	$ -	$ -	$ -	$ -
Design/Construct Geele and Taylor Wet Detention Basin	$ 1,537,278	239 (Pigeon River)	In Report	2034	$ -	$ -	$ -	$ -	$ -	$ -
Design/Construct WPS Wet Detention Basin	$ 752,325	24 (Sheboygan River)	In Report	2038	$ -	$ -	$ -	$ -	$ -	$ -
Design/Construct S. 20th Street Wet Detention Basin	$ 831,465	24 (Sheboygan River)	In Report	2042	$ -	$ -	$ -	$ -	$ -	$ -
Design/Construct Greenfield & 9th Wet Detention Basin	$ 1,613,325	316 (Lake Michigan)	In Report	2044	$ -	$ -	$ -	$ -	$ -	$ -
Design/Construct Polarware Site Wet Detention Basin	$ 3,241,390	315 (Lake Michigan)	In Report	2046	$ -	$ -	$ -	$ -	$ -	$ -
Conveyance Upgrades (Wilson Avenue Hot Spot Area): Implement 1/8 of Improvements	$ 1,888,913		In Report	2026	$ -	$ -	$ -	$ -	$ -	$ -
Conveyance Upgrades (Union Avenue Hot Spot Area): Implement 1/4 of Improvements	$ 426,225		In Report	2030						
Agricultural Water Quality Trading for TP (10.5 lbs at $125/lb TP; 1/20 per year starting in 2026 with full implementation in 2046)	$ 125.00		In Report		$ -	$ -	$ -	$ -	$ -	$ -
					$ 99,090	**$ 98,090**	**$ (40,938)**	**$ 252,730**	**$ 304,010**	**$ 723,926**
Storm Sewer Map	31-Mar-21									
Submit/Maintain Updated Storm Sewer System Map			In Report	On-going	$ 13,000	$ 15,000	$ 15,450	$ 15,914	$ 16,391	$ 16,883
Annual Report	31-Mar-21									
Compilation of Tracked Permit Activities			In Report	On-going	$ 1,000	$ 1,030	$ 1,061	$ 1,093	$ 1,126	$ 1,159
Prepare Annual Report			In Report	On-going	$ 2,500	$ 2,575	$ 2,652	$ 2,732	$ 2,814	$ 2,898
Permit Fee			In Report	On-going	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500
					$ 11,000	**$ 11,105**	**$ 11,213**	**$ 11,325**	**$ 11,439**	**$ 11,557**
TOTAL					**$ 548,090**	**$ 602,195**	**$ 518,027**	**$ 829,453**	**$ 841,728**	**$ 1,414,178**
					2020	2021	2022	2023	2024	2025
				Total No. of ERUs	49,683	49,683	50,180	50,682	51,189	51,701
				Annual Cost per ERU	$11.03	$12.12	$10.32	$16.37	$16.44	$27.35
				Monthly Cost per ERU	$0.92	$1.01	$0.86	$1.36	$1.37	$2.28
				2 Year ERU Average	$0.96		$1.11		$1.82	
				5 Year ERU Average			$1.30			

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Stormwater Utility Budget (see Table 7.04-2)

Annual ERU Charge	Monthly ERU Charge	ERUs	Potential Revenue Generated
$11.00	$0.92	49,683	$546,716
$12.00	$1.00	49,683	$596,201
$24.00	$2.00	49,683	$1,192,401
$36.00	$3.00	49,683	$1,788,602
$48.00	$4.00	49,683	$2,384,803
$60.00	$5.00	49,683	$2,981,004
$72.00	$6.00	49,683	$3,577,204
$84.00	$7.00	49,683	$4,173,405
$96.00	$8.00	49,683	$4,769,606
$108.00	$9.00	49,683	$5,365,806
$120.00	$10.00	49,683	$5,962,007
$132.00	$11.00	49,683	$6,558,208
$144.00	$12.00	49,683	$7,154,409
$156.00	$13.00	49,683	$7,750,609

Table 7.04-1 Potential Revenue per ERU Charge

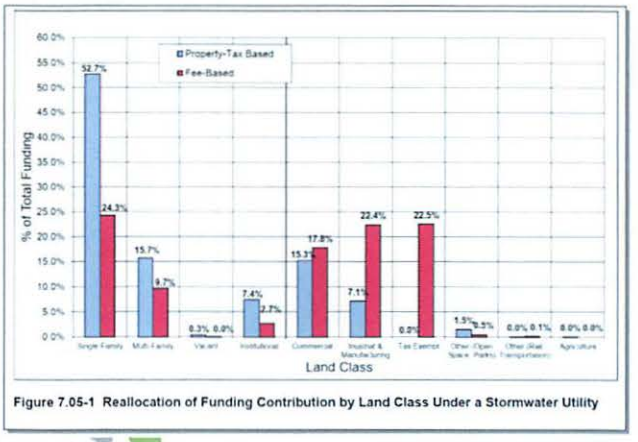
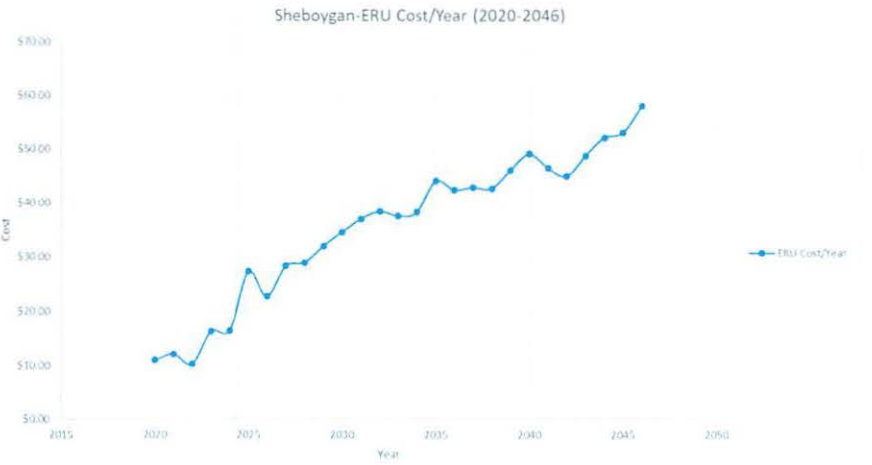


Figure 7.05-1 Reallocation of Funding Contribution by Land Class Under a Stormwater Utility

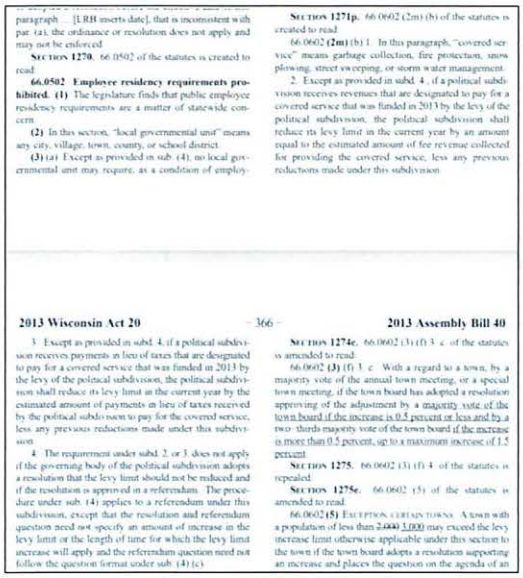




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Potential Stormwater Utility Next Steps

- **2013 Wisconsin Act 20**
  - Shift Cost to Utility From General Fund = Reduce Levy Limits Equivalent Amount
  - No Reduction of Levy Limits = Pass Referendum
  - It is recommended that the City Attorney weigh in on the City's ability to revive its stormwater utility that was adopted in 2003



paragraph ... [LRB inserts date], that is inconsistent with par. (a), the ordinance or resolution does not apply and may not be enforced.

SECTION 1270. 66.0502 of the statutes is created to read:

66.0502 Employee residency requirements prohibited. (1) The legislature finds that public employee residency requirements are a matter of statewide concern.

(2) In this section, "local governmental unit" means any city, village, town, county, or school district.

(3) (a) Except as provided in sub. (4), no local governmental unit may require, as a condition of employ-

SECTION 1271p. 66.0602 (2m) (b) of the statutes is created to read:

66.0602 **(2m)** (b) 1. In this paragraph, "covered service" means garbage collection, fire protection, snow plowing, street sweeping, or storm water management.

2. Except as provided in subd. 4., if a political subdivision receives revenues that are designated to pay for a covered service that was funded in 2013 by the levy of the political subdivision, the political subdivision shall reduce its levy limit in the current year by an amount equal to the estimated amount of fee revenue collected for providing the covered service, less any previous reductions made under this subdivision.

2013 Wisconsin Act 20 - 366 - **2013 Assembly Bill 40**

3. Except as provided in subd. 4., if a political subdivision receives payments in lieu of taxes that are designated to pay for a covered service that was funded in 2013 by the levy of the political subdivision, the political subdivision shall reduce its levy limit in the current year by the estimated amount of payments in lieu of taxes received by the political subdivision to pay for the covered service, less any previous reductions made under this subdivision.

4. The requirement under subd. 2. or 3. does not apply if the governing body of the political subdivision adopts a resolution that the levy limit should not be reduced and if the resolution is approved in a referendum. The procedure under sub. (4) applies to a referendum under this subdivision, except that the resolution and referendum question need not specify an amount of increase in the levy limit or the length of time for which the levy limit increase will apply and the referendum question need not follow the question format under sub. (4) (c).

SECTION 1274e. 66.0602 (3) (f) 3. c. of the statutes is amended to read:

66.0602 **(3)** (f) 3. c. With a regard to a town, by a majority vote of the annual town meeting, or a special town meeting, if the town board has adopted a resolution approving of the adjustment by a majority vote of the town board if the increase is 0.5 percent or less and by a two−thirds majority vote of the town board if the increase is more than 0.5 percent, up to a maximum increase of 1.5 percent.

SECTION 1275. 66.0602 (3) (f) 4. of the statutes is repealed.

SECTION 1275e. 66.0602 (5) of the statutes is amended to read:

66.0602 **(5)** EXCEPTION, CERTAIN TOWNS. A town with a population of less than ~~2,000~~ 3,000 may exceed the levy increase limit otherwise applicable under this section to the town if the town board adopts a resolution supporting an increase and places the question on the agenda of an

Stormwater Management Plan Update

↓

Concept-Level Stormwater Utility Feasibility Study

↓

Stormwater Utility Implementation →

- •Task Force
- •Finalize Rate Study (Impervious Area Analysis, SW Utility Budget, SW Utility Rates)
- •Billing System Review
- •SW Utility Master Account
- • Develop Ordinance and Credit Policy
- •Billing System Testing
- •Impervious Area Map Book
- •Public Information and Education (Narrative, PI meeting with top rate payers, tech assistance, FAQ)
- •Meetings

Stormwater Utility Benefits

- **Stormwater Utility Benefits**
  - Provides an equitable, stable, dedicated revenue source for stormwater-related projects
  - Credit policy could reduce rates for non-residential customers
  - Revenue source allows planning and paying for stormwater quality improvements for MS4/TMDL compliance and stormwater quantity improvements for flood control.
  - **Benefits** of Completing Stormwater Quality Projects:
    - Regulatory Compliance
    - Water Quality, Ecology, and Fisheries Improvements in Lake, Rivers, and Streams
    - Reduction of erosion in channels and creeks
    - Quality of Life and Aesthetics improvements
    - Resiliency to Climate Change
    - Promotes Green Infrastructure
  - **Benefits** of Completing Flood Control Projects:
    - Reduce potential lawsuits
    - Replace aging infrastructure
    - Reduce Flooding and Ensure Emergency Vehicle Access
    - Preserve property values





STRAND ASSOCIATES

Implications of MS4 Non-Compliance

- **Implications of non-compliance with MS4 permit requirements**
  - **Short-term:** WDNR will work with community on path to compliance.
  - **Long-term:** If community elects non-compliance, WDNR has authority to refer the community to the US Department of Justice subjecting the community to significant fines.

THE UNITED STATES DEPARTMENT of JUSTICE

STRAND ASSOCIATES

Recommendations

- **MS4 Programs:** Continue existing and initiate updates to Stormwater Programs discussed in Section 3.
  - Generally increased documentation for annual reporting
  - Implement modified IDDE screening at outfalls
  - New erosion control and stormwater ordinances
  - New construction site procedures
  - New long-term maintenance of public and private stormwater BMPs

- **Stormwater Quality:** Consider pursuit of Alternative 1 for Northeast Lakeshore TMDL Compliance as discussed in Section 5 *(see Table 8.03-1 TMDL Implementation Plan)*
  - Constructed BMPs - Pursue WDNR UNPS grant funds for any constructed BMPs.
  - Water Quality Trading - Further investigate opportunities with other MS4s and Private Point Dischargers. Investigate WQT clearinghouse under Wisconsin Act 151.
  - Watershed Adaptive Management – If materializes in future, reanalyze City's position at that time.
  - TP Credit for Leaf Collection Program - Complete analysis to determine potential credit.

- **Stormwater Quantity:** Consider pursuit of conveyance and detention upgrades discussed in Section 6 to provide flood relief along Union Avenue and Wilson Avenue. Pursue WDNR Municipal Flood Control grant funds for upgrades.

- **Stormwater Utility:** Consider reviving the stormwater utility as described in Section 7 OR budget appropriate amounts in general fund to fully implement stormwater programs.

STRAND ASSOCIATES

Recommendations

Table 8.03-1 TMDL Implementation Plan (lbs TP)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Water Quality Trading					0.5	1.1	1.6	2.1	2.6	3.2	3.7	4.2	4.7	5.3	5.8	6.3	6.8	7.4	7.9	8.4	8.9	9.5	10.0	10.5	10.5
2nd Creek Dry to Wet Pond		27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8	27.8
Wilson and 9th Wet Pond					105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8	105.8
Union Street Underground Wet Pond									6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9	6.9
Geele and Taylor Wet Pond													42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
WPS Wet Pond																	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3	18.3
South 20th Street Wet Pond																					15.3	15.3	15.3	15.3	15.3
Greenfield & 9th Wet Pond																							46.5	46.5	46.5
Polarware Site Wet Pond																									81.0
Enhanced Street Sweeping		19.5	19.5	39.0	39.0	58.6	58.6	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1	78.1
TP Leaf Credit (To Be Determined)																									
Redevelopment at 40% TSS Reduction	3.4	6.7	10.1	13.5	16.9	20.2	23.6	27.0	30.4	33.7	37.1	40.5	43.8	47.2	50.6	54.0	57.3	60.7	64.1	67.5	70.8	74.2	77.6	80.9	84.3
Private BMPs (To Be Determined)																									
Total	**3.4**	**54.1**	**57.4**	**80.3**	**190.0**	**213.4**	**217.3**	**240.8**	**251.6**	**255.5**	**259.3**	**263.2**	**310.0**	**313.9**	**317.8**	**321.7**	**343.9**	**347.8**	**351.7**	**355.6**	**374.8**	**378.7**	**429.1**	**433.0**	**517.4**
Permit Required (10% of TP Reduction Gap by 2030)										**50.1**															

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CITY OF SHEBOYGAN

REQUEST FOR PUBLIC WORKS COMMITTEE CONSIDERATION

ITEM DESCRIPTION: A resolution authorizing accepting an easement for a mini-storm sewer.

REPORT PREPARED BY: Ryan Sazama, City Engineer

REPORT DATE: December 9, 2021 **MEETING DATE:** December 14, 2021

FISCAL SUMMARY:

Budget Line Item:	N/A
Budget Summary:	N/A
Budgeted Expenditure:	N/A
Budgeted Revenue:	N/A

STATUTORY REFERENCE:

Wisconsin Statutes:	N/A
Municipal Code:	N/A

BACKGROUND / ANALYSIS: The City of Sheboygan through the capital improvements program budgets $50,000 for the construction or the extension of mini-storm sewers throughout the City. These mini-storm sewers are constructed to help alleviate storm water issues in residential neighborhoods particularly for standing water in backyards or to alleviate issues with sump pumps that discharge at a large rate. Many times to construct these mini-storm sewers the City of Sheboygan must receive easements giving the City the permission to construct these mini-storm sewers on private property.

STAFF COMMENTS: This resolution grants the City of Sheboygan an easement so that a mini-storm sewer can be constructed on private property at the residence located at 2637 Riverdale Avenue.

ACTION REQUESTED: Motion to recommend the Common Council adopt Res. No. 107-21-22 authorizing accepting an easement for a mini-storm sewer.

ATTACHMENTS:

I. Res. No. 107-21-22
II. Easement

III

4.6

Res. No. 107 - 21 - 22. By Alderpersons Dekker and Perrella.
December 6, 2021.

A RESOLUTION authorizing accepting an easement for a mini-storm sewer.

RESOLVED: That the Mayor and City Clerk are hereby authorized and directed to accept the attached Easement for the City to construct a mini-storm sewer at the following location:

Kenneth P. Molitor and Lori K. Molitor, 2637 Riverdale Avenue, Sheboygan, WI

PW

Dean Dekker

Gavin Perrella

I HEREBY CERTIFY that the foregoing Resolution was duly passed by the Common Council of the City of Sheboygan, Wisconsin, on the _____ day of _____, 20____.

Dated _____ 20____. _____, City Clerk

Approved _____ 20____. _____, Mayor

EASEMENT

THIS INDENTURE, made this ____day of _____, 2021, by Kenneth P. Molitor and Lori K. Molitor residing at 2637 Riverdale Avenue, Sheboygan, Wisconsin 53081, **"GRANTOR,"** and the City of Sheboygan, a Municipal Corporation of the State of Wisconsin, **"GRANTEE";**

Return To:
City Attorney
828 Center Avenue, Suite 210
Sheboygan WI 53081

59281-435663
Tax Parcel No.

WITNESSETH:

KNOW ALL MEN BY THESE PRESENTS, that the said **GRANTOR,** in consideration of the sum of one ($1.00) dollar and other valuable consideration in hand paid by said **GRANTEE,** receipt whereof is hereby confessed and acknowledged, and the covenants hereinafter contained, hereby grants a permanent easement to **GRANTEE** for municipal purposes, to construct and maintain a mini-storm sewer in, under, and along the East 8' (eight feet) of the following described property:

Lot Sixty-three (63) Fox Meadows Addition No. 4, CITY OF SHEBOYGAN, SHEBOYGAN COUNTY, STATE OF WISCONSIN

The **GRANTOR** further grants unto the **GRANTEE,** its successors and assigns, the right, privilege and easement to enter on said premises for the purposes of laying, patrolling, maintaining, cleaning, repairing and renewing said mini-storm sewer.

GRANTEE shall not specially assess **GRANTOR** for the mini-storm sewer construction. However, **GRANTOR** acknowledges and agrees that no site restoration is to be provided by **GRANTEE** in connection with construction of the mini-storm sewer.

The covenants herein contained shall be binding upon the parties hereto and their successors and assigns.

IN WITNESS WHEREOF, the **GRANTOR,** has caused the execution of this document on this 15 day of NOVEMBER, 2021.

Kenneth P. Molitor

Kenneth P. Molitor
(Sign in the presence of a Notary Public)

Lori K. Molitor
(Sign in the presence of a Notary Public

STATE OF WISCONSIN)
) §
SHEBOYGAN COUNTY)

Personally came before me, this 15 day of November, 2021, Kenneth P. Molitor and Lori K. Molitor, to me known to be the person(s) who executed the foregoing instrument and acknowledged the same.

DAWN SOKOLOWSKI
Notary Public
State of Wisconsin

Notary Public-Sheboygan County
My commission expires 9/27/2022

ACCEPTED BY: CITY OF SHEBOYGAN

BY:
Ryan Sorenson
Mayor

ATTEST:
Meredith DeBruin
City Clerk

STATE OF WISCONSIN)
) §
SHEBOYGAN COUNTY)

Personally came before me, this 17th day of November, 2021, Ryan Sorenson, Mayor, and Meredith DeBruin, City Clerk, of the above-named municipal corporation, to me known to be such Mayor and City Clerk of said corporation, and acknowledged that they executed the foregoing instrument as such officers of said corporation, by its authority.

MELISSA CLEVENGER
NOTARY
PUBLIC
STATE OF WISCONSIN

Melissa Clevenger
Melissa Clevenger
Notary Public-Sheboygan County
My commission expires 08/01/2025

Acceptance is authorized by and in accordance with Res. No._____.

This instrument drafted by:

Charles C. Adams
Wisconsin State Bar No. 01021454

CITY OF SHEBOYGAN

REQUEST FOR PUBLIC WORKS COMMITTEE CONSIDERATION

ITEM DESCRIPTION: A resolution authorizing executing an easement for a mini-storm sewer.

REPORT PREPARED BY: Ryan Sazama, City Engineer

REPORT DATE: December 9, 2021 **MEETING DATE:** December 14, 2021

FISCAL SUMMARY:

Budget Line Item:	N/A
Budget Summary:	N/A
Budgeted Expenditure:	N/A
Budgeted Revenue:	N/A

STATUTORY REFERENCE:

Wisconsin Statutes:	N/A
Municipal Code:	N/A

BACKGROUND / ANALYSIS: The City of Sheboygan through the capital improvements program budgets $50,000 for the construction or the extension of mini-storm sewers throughout the City. These mini-storm sewers are constructed to help alleviate storm water issues in residential neighborhoods particularly for standing water in backyards or to alleviate issues with sump pumps that discharge at a large rate. Many times to construct these mini-storm sewers the City of Sheboygan must receive easements giving the City the permission to construct these mini-storm sewers on private property.

STAFF COMMENTS: This resolution grants the City of Sheboygan an easement so that a mini-storm sewer can be constructed on private property at the residence located at 2906 South 10th Street.

ACTION REQUESTED: Motion to recommend the Common Council adopt Res. No. 108-21-22 authorizing executing an easement for a mini-storm sewer.

ATTACHMENTS:

I. Res. No. 108-21-22
II. Easement

III

4.7

Res. No. 108 - 21 - 22. By Alderpersons Dekker and Perrella.
December 6, 2021.

A RESOLUTION authorizing executing an easement for a mini-storm sewer.

RESOLVED: That the Mayor and City Clerk are hereby authorized and directed to execute the attached Easement for the City to construct a mini-storm sewer at the following location:

Patricia A. Pilon, 2906 South 10th Street, Sheboygan, WI

PW

Dean Dekker

Charles Perrella

I HEREBY CERTIFY that the foregoing Resolution was duly passed by the Common Council of the City of Sheboygan, Wisconsin, on the _____ day of _____, 20____.

Dated _____ 20____. _____, City Clerk

Approved _____ 20____. _____, Mayor

EASEMENT

THIS INDENTURE, made this 22 day of November, 2021, by Patricia A. Pilon, Sheboygan, Wisconsin 53081, **"GRANTOR,"** and the City of Sheboygan, a Municipal Corporation of the State of Wisconsin, **"GRANTEE";**

Return To:
City Attorney
828 Center Avenue, Suite 210
Sheboygan WI 53081-4442

59281-308120
Tax Parcel No.

WITNESSETH:

KNOW ALL PERSONS BY THESE PRESENTS, that the said **GRANTOR,** in consideration of the sum of one ($1.00) dollar and other valuable consideration in hand paid by said **GRANTEE,** receipt whereof is hereby confessed and acknowledged, and the covenants hereinafter contained, hereby grants a permanent easement to **GRANTEE** for municipal purposes, to construct and maintain a mini-storm sewer in, under, and along the South 8' (eight feet) of the following described property:

Lot Sixteen (16), Block Two (2), Assessment Subdivision Number Twenty (20), excepting therefrom the West Seventy-five (75) feet thereof in the City of Sheboygan according to the plat thereof, CITY OF SHEBOYGAN, SHEBOYGAN COUNTY, STATE OF WISCONSIN.

The **GRANTOR** further grants unto the **GRANTEE,** its successors and assigns, the right, privilege and easement to enter on said premises for the purposes of laying, patrolling, maintaining, cleaning, repairing and renewing said mini-storm sewer.

GRANTEE shall not specially assess **GRANTOR** for the mini-storm sewer construction. However, **GRANTOR** acknowledges and agrees that no site restoration is to be provided by **GRANTEE** in connection with construction of the mini-storm sewer.

The covenants herein contained shall be binding upon the parties hereto and their successors and assigns.

IN WITNESS WHEREOF, the **GRANTOR,** has caused the execution of this document on this 22 day of November, 2021.

Patricia Pilon

Patricia A Pilon
(Sign in the presence of a Notary Public)

(Sign in the presence of a Notary Public

STATE OF WISCONSIN)
) §
SHEBOYGAN COUNTY)

Personally came before me, this 22 day of November, 2021, Patricia A. Pilon to me known to be the person(s) who executed the foregoing instrument and acknowledged the same.

KIMBERLY K ANDERSON
NOTARY PUBLIC
STATE OF WISCONSIN

Kimberly K. Anderson
Kimberly K Anderson
Notary Public-Sheboygan County
My commission expires 08/05/2025

ACCEPTED BY: CITY OF SHEBOYGAN

BY: _____
Ryan Sorenson
Mayor

ATTEST: _____
Meredith DeBruin
City Clerk

STATE OF WISCONSIN)
) §
SHEBOYGAN COUNTY)

Personally came before me, this _____day of_____, 2021, Ryan Sorenson, Mayor, and Meredith DeBruin, City Clerk, of the above-named municipal corporation, to me known to be such Mayor and City Clerk of said corporation, and acknowledged that they executed the foregoing instrument as such officers of said corporation, by its authority.

_____
_____
Notary Public-Sheboygan County
My commission expires _____

Acceptance is authorized by and in accordance with Res. No._____.

This instrument drafted by:

Charles C. Adams
Wisconsin State Bar No. 01021454

III

4.8

Res. No. 109 - 21 - 22. By Alderpersons Dekker and Perrella.
December 6, 2021.

A RESOLUTION authorizing executing an easement for a mini-storm sewer.

RESOLVED: That the Mayor and City Clerk are hereby authorized and directed to execute the attached Easement for the City to construct a mini-storm sewer at the following location:

Nathaniel D. White, 2308 West Mark Drive, Sheboygan, WI

PW

I HEREBY CERTIFY that the foregoing Resolution was duly passed by the Common Council of the City of Sheboygan, Wisconsin, on the _____ day of _____, 20____.

Dated _____ 20____. _____, City Clerk

Approved _____ 20____. _____, Mayor

EASEMENT

THIS INDENTURE, made this ____day of _____, 2021, by Nathaniel D. White residing at 2308 West Mark Drive, Sheboygan, Wisconsin 53081, **"GRANTOR,"** and the City of Sheboygan, a Municipal Corporation of the State of Wisconsin, **"GRANTEE";**

Return To:
City Attorney
828 Center Avenue, Suite 210
Sheboygan WI 53081

59281-616970
Tax Parcel No.

WITNESSETH:

KNOW ALL MEN BY THESE PRESENTS, that the said **GRANTOR,** in consideration of the sum of one ($1.00) dollar and other valuable consideration in hand paid by said **GRANTEE,** receipt whereof is hereby confessed and acknowledged, and the covenants hereinafter contained, hereby grants a permanent easement to **GRANTEE** for municipal purposes, to construct and maintain a mini-storm sewer in, under, and along the north 7' seven feet of the east 100' one hundred feet of the following described property:

> Lot Eight (8) Block Thirty-one (31), Graceland Subdivision No. 18 CITY OF SHEBOYGAN,
> SHEBOYGAN COUNTY, STATE OF WISCONSIN

The **GRANTOR** further grants unto the **GRANTEE,** its successors and assigns, the right, privilege and easement to enter on said premises for the purposes of laying, patrolling, maintaining, cleaning, repairing and renewing said mini-storm sewer.

GRANTEE shall not specially assess **GRANTOR** for the mini-storm sewer construction. However, **GRANTOR** acknowledges and agrees that no site restoration is to be provided by **GRANTEE** in connection with construction of the mini-storm sewer.

The covenants herein contained shall be binding upon the parties hereto and their successors and assigns.

IN WITNESS WHEREOF, the **GRANTOR,** has caused the execution of this document on this 29 day of November, 2021.

Nathaniel D. White
(Sign in the presence of a Notary Public)

(Sign in the presence of a Notary Public

STATE OF WISCONSIN)
) §
SHEBOYGAN COUNTY)

Personally came before me, this 29th day of November, 2021, Nathaniel D. White, to me known to be the person(s) who executed the foregoing instrument and acknowledged the same.

Melissa Fassbender
Notary Public-Sheboygan County
My commission expires 10/07/2025

ACCEPTED BY: CITY OF SHEBOYGAN

BY: _____
Ryan Sorenson
Mayor

ATTEST: _____
Meredith DeBruin
City Clerk

STATE OF WISCONSIN)
) §
SHEBOYGAN COUNTY)

Personally came before me, this _____day of_____, 2021, Ryan Sorenson, Mayor, and Meredith DeBruin, City Clerk, of the above-named municipal corporation, to me known to be such Mayor and City Clerk of said corporation, and acknowledged that they executed the foregoing instrument as such officers of said corporation, by its authority.

_____
Notary Public-Sheboygan County
My commission expires _____

Acceptance is authorized by and in accordance with Res. No._____.

This instrument drafted by:

Charles C. Adams
Wisconsin State Bar No. 01021454

CITY OF SHEBOYGAN

REQUEST FOR PUBLIC WORKS COMMITTEE CONSIDERATION

ITEM DESCRIPTION: A resolution authorizing executing an easement for a mini-storm sewer.

REPORT PREPARED BY: Ryan Sazama, City Engineer

REPORT DATE: December 9, 2021 **MEETING DATE:** December 14, 2021

FISCAL SUMMARY:

Budget Line Item:	N/A
Budget Summary:	N/A
Budgeted Expenditure:	N/A
Budgeted Revenue:	N/A

STATUTORY REFERENCE:

Wisconsin Statutes:	N/A
Municipal Code:	N/A

BACKGROUND / ANALYSIS: The City of Sheboygan through the capital improvements program budgets $50,000 for the construction or the extension of mini-storm sewers throughout the City. These mini-storm sewers are constructed to help alleviate storm water issues in residential neighborhoods particularly for standing water in backyards or to alleviate issues with sump pumps that discharge at a large rate. Many times to construct these mini-storm sewers the City of Sheboygan must receive easements giving the City the permission to construct these mini-storm sewers on private property.

STAFF COMMENTS: This resolution grants the City of Sheboygan an easement so that a mini-storm sewer can be constructed on private property at the residence located at 2308 West Mark Drive.

ACTION REQUESTED: Motion to recommend the Common Council adopt Res. No. 109-21-22 authorizing executing an easement for a mini-storm sewer.

ATTACHMENTS:

I. Res. No. 109-21-22
II. Easement

III

OTHER MATTERS

7.2

Res. No. 111 - 21 - 22. By Alderpersons Dekker and Perrella.
December 6, 2021.

A RESOLUTION authorizing the appropriate City officials to enter into a contract with J.H. Hassinger, Inc. for the renovation of 1817 N. 8th Street to be used as the new location for Uptown Social / the Sheboygan Senior Activity Center, and authorizing the appropriate City officials to make the necessary budget adjustments and appropriations to provide funding for this contract.

WHEREAS, as a result of the COVID-19 pandemic, it was necessary for the former location of the Sheboygan Senior Activity Center - 428 Wisconsin Ave. - to close temporarily; and

WHEREAS, while the Sheboygan Senior Activity Center was closed temporarily, City staff learned that there were significant issues with the Heating, Ventilation, and Air Conditioning (HVAC) System at 428 Wisconsin Ave., such that the building at 428 Wisconsin Ave. was no longer safe to use; and

WHEREAS, as such, the City permanently closed the Senior Activity Center at 428 Wisconsin Ave.; and

WHEREAS, the City of Sheboygan purchased 1817 N. 8th Street with the intent of renovating the building into the new home of the Sheboygan Senior Activity Center; and

WHEREAS, the Sheboygan Senior Activity Center is now known as Uptown Social; and

WHEREAS, the City of Sheboygan has advertised for bids for the renovations of 1817 N. 8th Street (the "Project"); and

WHEREAS, the low bid was from J.H. Hassinger, Inc. ("J.H. Hassinger"); and

WHEREAS, J.H. Hassinger's base bid was $3,482,510.00; and

WHEREAS, the Project also includes an alternate; and

WHEREAS, J.H. Hassinger's bid would complete the column removal requested in the alternate for $89,451.00; and

PW
2/3 VOTE

WHEREAS, City Staff has reviewed the bids and determined that the low bid met all of the specifications for the Project; and

WHEREAS, the initial plan to fund the Project was through a Section 108 Loan from the U.S. Department of Housing and Urban Development ("Section 108 Loan"); and

WHEREAS, due to rising construction prices, the Section 108 Loan will not be sufficient to pay for the Project and reimburse the City for the purchase price of 1817 N. 8th Street paid previously; and

WHEREAS, there are a number of sources of funds which can be used together to ensure there is adequate funding for the Project (including reimbursement of the purchase price); and

WHEREAS, one source of funds is the American Rescue Plan Act ("ARPA"); and

WHEREAS, in Res. No. 71-21-22, the Council expressed its then-current plan as to how it would allocate the City's $22.8 million allocation of ARPA funds; and

WHEREAS, while the Council initially intended to use $9,950,000 of ARPA Funds toward the Southside Interceptor Sanitary Sewer Project, because that project has been awarded other federal funds, some of the ARPA funds can be used to assist with the Project; and

WHEREAS, it is appropriate to use the APRA funds for this Project, because the Project is a capital investment to a public facility that responds to the COVID-19 Public Health Emergency; and

WHEREAS, because of the issues with the HVAC System at 428 Wisconsin Ave., the Common Council of the City of Sheboygan finds that the Project responds to a specific pandemic-related public health need, namely the need for a Senior Activity Center with adequate HVAC to limit the spread of COVID-19; and

WHEREAS, the Friends of the Senior Activity Center have agreed to contribute $89,451.00 to pay for the cost of the alternate; and

WHEREAS, in Res. No. 77-21-22, the Council increased the budgeted appropriation in the Capital Fund (Account No. 40015100-411100) by $375,000; and

WHEREAS, it is appropriate to set aside $275,000 from that increase for change orders that may arise during the course of the Project.

NOW, THEREFORE, BE IT RESOLVED: That the appropriate City officials are authorized to sign the Agreement with J.H. Hassinger, in substantially similar form to that included in the Project Manual, a copy of which is attached.

BE IT FURTHER RESOLVED: That the appropriate City officials are authorized to sign the Title VI Addendum to the Agreement with J.H. Hassinger, in substantially similar form to that attached.

BE IT FURTHER RESOLVED: That the appropriate City officials are authorized to take the steps necessary to receive $89,451.00 from the Friends of the Senior Activity Center and receipt it in the Capital Improvements Fund.

BE IT FURTHER RESOLVED: That upon receipt of $89,451.00 from the Friends of the Senior Activity Center, the appropriate City officials are authorized to accept proceeding with the alternate in addition to the base bid.

BE IT FURTHER RESOLVED: That the appropriate City officials are authorized to draw funds, not to exceed $3,846,961 (which includes the base bid, the alternate bid, and a change order allowance), pursuant to the terms of the Agreement from:

$2,700,000	CDBG - Buildings (Account No. 21961100-621100)[1]
$ 782,510	Federal Grants Fund - Buildings (Account No. 20115100-621100)
$ 364,451	Capital Fund (Account No. 48053000-621100)

BE IT FURTHER RESOLVED: That, upon receipt of $89,451 from the Friend of the Senior Activity Center, the Finance Director is authorized to increase the previously budgeted appropriation for Capital Improvements - Buildings (Account No. 48053000-621100) by $364,451.

---

[1] Because the Section 108 Loan will be administered on a reimbursement basis, for the avoidance of doubt, the appropriate City officials may draw funds and submit reimbursement requests regarding the Section 108 Loan at appropriate intervals. In the event that the City ultimately receives less than the anticipated $3,200,000 from the Section 108 Loan - which includes $500,000 to reimburse City for the purchase price of 1817 N. 8th Street - General Fund fund balance shall bear the unreimbursed cost of the Project.

BE IT FURTHER RESOLVED: That the funds to support this increased appropriation come from the following locations:

$ 89,451	Capital Improvements - Contributions (Account No. 48015100-467101)
$275,000	Capital Improvements - Fund Equity Applied (Account No. 48015100-499999)

_____

_____

I HEREBY CERTIFY that the foregoing Resolution was duly passed by the Common Council of the City of Sheboygan, Wisconsin, on the _____ day of _____, 20____.

Dated _____ 20 . _____, City Clerk

Approved _____ 20 . _____, Mayor

Title VI Addendum
Between the City of Sheboygan
and
J.H. Hassinger, Inc.

Background

The City of Sheboygan (the "City") and J.H. Hassinger, Inc. ("Contractor") have, contemporaneously with this Addendum, entered into an Agreement regarding Renovations at the Sheboygan Senior Activity Center / Uptown Social, 1817 N. 8th Street (the "Project").

The City plans to use ARPA Funds to pay for a portion of the contract price. As such, among other things, the City is required to have Contractor comply with certain assurances related to Title VI of the Civil Rights Act.

The Assurances

As a condition of the City entering into the Agreement regarding the Project with Contractor, Contractor agrees to:

1. Ensure its current and future compliance with Title VI of the Civil Rights Act of 1964, as amended, which prohibits exclusion from participation, denial of the benefits of, or subjection to discrimination under programs and activities receiving federal financial assistance, of any person in the United States on the ground of race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by the Department of the Treasury Title VI regulations at 31 CFR Part 22 and other pertinent executive orders such as Executive Order 13166, directives, circulars, policies, memoranda, and/or guidance documents.
2. Acknowledge that Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency," seeks to improve access to federally assisted programs and activities for individuals who, because of national origin, have Limited English Proficiency (LEP). Contractor understands that denying a person access to its programs, services, and activities because of LEP is a form of national origin discrimination prohibited under Title VI of the Civil Rights Act of 1964 and the Department of the Treasury's directives, to ensure that LEP persons have meaningful access to its programs, services, and activities. Contractor understands and agrees that meaningful access may entail providing language assistance services, including oral interpretation and written translation where necessary, to ensure effective communication in the Contractor's programs, services, and activities.
3. Consider the need for language services for LEP persons when Contractor develops applicable budgets and conducts programs, services, and activities. As a resource, the Department of the Treasury has published its LEP guidance at 70 FR 6067. For more information on taking reasonable steps to provide meaningful access for LEP persons, please visit http://www.lep.gov.
4. Acknowledge that compliance with the Assurances is binding upon Contractor and Contractor's successors, transferees, and assignees for the period in which federal financial assistance is provided.
5. Require any subcontractors, successors, transferees, and assignees to comply with the Assurances in this Title VI Addendum.

6. Comply with, and include in any contract subject to Title VI and its regulations:

   The sub-grantee, contractor, subcontractor, successor, transferee, and assignee shall comply with Title VI of the Civil Rights Act of 1964, which prohibits recipients of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin (42 U.S.C. § 2000d et seq.), as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, which are herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection to persons with "Limited English Proficiency" in any program or activity receiving federal financial assistance, 42 U.S.C. § 2000d et seq., as implemented by the Department of the Treasury's Title VI regulations, 31 CFR Part 22, and herein incorporated by reference and made a part of this contract or agreement.

City of Sheboygan	Contractor
_____	_____
Signature	Signature
_____	_____
Printed Name	Printed Name
_____	_____
Date	Date

EQUAL OPPORTUNITY CLAUSE (EO 11246)

(For Contractors – Federally Assisted Construction Contracts)

During the performance of this contract, the contractor agrees as follows:

1. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
2. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
3. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.
4. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
5. The contractor will comply with all provisions of Executive Order No. 11246 of Sept. 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

6. The contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

7. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept. 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

8. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions including sanctions for noncompliance:

   Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

9. The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: *Provided*, that if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

10. The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

11. The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the

Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

City of Sheboygan	Contractor
_____	_____
Signature	Signature
_____	_____
Printed Name	Printed Name
_____	_____
Date	Date

INCORPORATION OF REQUIRED CLAUSES

The City of Sheboygan and Contractor recognize that because the work to be completed under this contract is anticipated to be funded, at least in part, with funding from the federal government, certain federal statutes, regulations, and executive orders are potentially applicable to this contract.

Compliance with Applicable Law and Regulations

For the avoidance of doubt, Contractor agrees to comply with any applicable federal statutes, regulations, and executive orders while completing its work under this contract.

Statutes and regulations prohibiting discrimination applicable to this contract may include, without limitation:

1. Title VI of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d et seq.) and Treasury's implementing regulations at 31 C.F.R. Part 22, which prohibit discrimination on the basis of race, color, or national origin under programs or activities receiving federal financial assistance
2. The Fair Housing Act, Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§ 3601 et seq.), which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status, or disability
3. Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794), which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance
4. The Age Discrimination Act of 1975, as amended (42 U.S.C. §§ 6101 et seq.), and Treasury's implementing regulations at 31 C.F.R. Part 23, which prohibit discrimination on the basis of age in programs or activities receiving federal financial assistance
5. Title II of the Americans with Disabilities Act of 1990, as amended (42 U.S.C. §§ 12101 et seq.), which prohibits discrimination on the basis of disability under programs, activities, and services provided or made available by state or local governments or instrumentalities or agencies thereto
6. Section 109 of the Housing and Community Development Act of 1974, which prohibits discrimination on the basis of race, color, national origin, sex, age, or handicap under any program or activity funded in whole or in part with funds made available under this title.

Federal regulations applicable to this contract may include, without limitation:

1. Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (2 C.F.R. Part 200), other than such provisions as Treasury may

determine are inapplicable and subject to such exceptions as may be otherwise provided by Treasury.

2. Universal Identifier and System for Award Management (SAM) (2 C.F.R. Part 25) (including the award term set forth in Appendix A to 2 C.F.R. Part 25)
3. Reporting Subaward and Executive Compensation Information (2 C.F.R. Part 170) (including the award term set forth in Appendix A to 2 C.F.R. Part 170)
4. OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement) (2 C.F.R. Part 180) (including the requirement to include a term or condition in all lower tier covered transactions)
5. Recipient Integrity and Performance Matters
6. Governmentwide Requirements for Drug-Free Workplace (31 C.F.R. Part 20)
7. New Restrictions on Lobbying (31 C.F.R. Part 21)
8. Uniform Relocation Assistance and Real Property Acquisition Act of 1970 (42 U.S.C. §§ 4601-4655) and implementing regulations
9. Generally Applicable Federal Environmental Laws and Regulations

Encouragement to Contractor

Increasing Seat Belt Use in the United States. Pursuant to Executive Order 13043, 62 FR 19217 (April 18, 1997), the City encourages contractor to adopt and enforce on-the-job seat belt policies and programs for their employees when operating company-owned, rented or personally owned vehicles.

Reducing Text Messaging While Driving. Pursuant to Executive Order 13513, 74 FR 51225 (Oct. 6, 2009), the City encourages its employees, subrecipients, and contractors to adopt and enforce policies that ban text messaging while driving, and Recipient should establish workplace safety policies to decrease accidents caused by distracted drivers.

Incorporation of Required Clauses and Conditions

To the extent any applicable federal statute, regulation, or executive order requires any clause or condition to be included or incorporated into this contract between the City of Sheboygan and the contractor, and that term or condition has not been expressly included or incorporated, it is included or incorporated by reference.

To the extent Contractor is required, by this contract or by any applicable federal statute, regulation, or executive order, to include or incorporate any clause or condition into its subcontracts or Contractor agrees to ensure that any term

Incorporation of Required Clauses:

1. To the extent any federal regulation requires the inclusion or incorporation of any term or condition in the agreement between the City of Sheboygan and the contractor, and that term or condition has not been expressly included or incorporated, it is included or incorporated by reference.
2. Contractor agrees to ensure that any term or condition it is required to include in any subcontract or purchase order is included.

City of Sheboygan	Contractor
_____	_____
Signature	Signature
_____	_____
Printed Name	Printed Name
_____	_____
Date	Date

PROJECT MANUAL

BID NUMBER:
2004-21

City of Sheboygan
spirit on the lake.

Sheboygan Senior Activity Center / Uptown Social
Phase I Remodel
1817 North 8th Street, Sheboygan WI 53801

September 27,2021

Groth Design Group

N58W6181 Columbia Road,
Cedarburg WI 53012
262-377-8001

CITY OF SHEBOYGAN
PUBLIC WORKS
Engineering Division
2026 New Jersey Ave
Sheboygan, WI 53081

SHEBOYGAN SENIOR ACTIVITY CENTER – PHASE I REMODEL

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ADVERTISEMENT FOR BIDS
CITY OF SHEBOYGAN
Sheboygan Senior Activity Center / Uptown Social
Phase I Remodel

Bid No. 2004-21

Owner and Work: The City of Sheboygan hereby gives notice that sealed public bids will be received for Sheboygan Senior Activity Center / Uptown Social– Phase I Remodel, 1817-North 8th Street , Sheboygan WI 53081. The majority work of this contract is generally described as follows:

The future home of the Sheboygan Senior Activity Center/Uptown Social project is the adaptive reuse of an existing CMU and Steel frame building formerly used as a grocery and pet store. The project involves furnishing and installation of a project sign at the site, demolition of the existing interior walls and fixtures to prep for new interior build out. There will be new window and door openings created in the existing exterior CMU walls, as well as adding projecting window boxes. The existing exterior finishes will be updated, and a new membrane roof installed. The interior will be built out with new partitions, fixtures and finishes to create office spaces, a café, lounge, game room, creative studio, and dance studio spaces, as well as bathrooms and corridors. Several spaces will be left as "grey box" areas for future development with limited work in the first phase. Fire protection, Plumbing, HVAC and Electrical systems are fully engineered. All site work (Divisions 31, 32 & 33) will be "self-performed" by the City of Sheboygan.

Time and Place of Bid Opening: Bids will be received until 2:00 PM Local Time on Wednesday, October 27, 2021 at the Sheboygan Municipal Service Building, 2026 New Jersey Avenue, Sheboygan WI 53081. Bids will be received via U.S Mail, Express Courier or in person. Only Paper bids will be accepted. As soon as practical after said closing time, all qualified bids will be opened and read aloud. Bidders are welcome but not required to attend. Bidders will be notified of the results via email as soon as possible following the bid opening.

Pre-bid Conference: A mandatory pre-bid conference for the Project will be held on 2:00 PM Local Time on Wednesday, October 13, 2021 at the jobsite , 1817 North 8th Street, Sheboygan WI 53081 Bids will not be opened or accepted from Bidders that do not attend the mandatory pre-bid conference.

Bidding Documents: Complete digital project bidding documents are available by contacting the Purchasing Agent. Bernard Rammer, at (920) 459-3469 or via email at Bernard.rammer@sheboyganwi.gov.

Pre-Bid Qualification: All bidders shall be required to file or have on file a valid Bidder's Proof of Responsibility form with the Engineering Division, City of Sheboygan, not less than five (5) days prior to the time of opening of these bids. Only bidders who have demonstrated their qualifications to perform the work will be permitted to bid. Forms are included in the bid documents.

Bid Security: A satisfactory Bid Bond, payable to the City of Sheboygan, WI, in an amount not less than five (5%) percent of the bid.

Wage Rates: Attention is called to the fact that this project is funded through a Community Development Block Grant. The Contractor as well as any Sub-Contractors will be required to pay not less than the Prevailing wages rates, as published by the United States Department of Labor and System for Award Management. A copy of determination # WI 20210016 is included in the bid documents. The bidder's attention is also called to the Notice for the Requirement of Affirmative Action

to insure Equal Employment Opportunity for employment of women and minorities in the project area. In addition, it is the policy for this project that minority business enterprises shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with Federal funding under this agreement.

The City of Sheboygan has contracted with a third party to provide payroll and wage monitoring for this project. The Contractor will be expected to work closely with the organization, Bay Lake Regional Planning Commission, to assure adherence to wage and payroll requirements.

Attention of bidders is also called to the fact that the successful bidder must insure the employees are applicants for employment are not discriminated against because of their race, color, sex, religion or national origin. The attention of the bidders is particularly called to the Federal requirements for equal opportunity (Executive Order 11246, Segregated Facilities, Section 109 and Section 3) and the conditions of employment to be observed and minimum wage rates to be paid under the contract.

Any contract or contracts awarded under this advertisement for bids may be funded in part by a grant from The Community Development Block Grant Program and a United States Department of Housing and Urban Development Section 108 Loan Guarantee Program.

The City of Sheboygan reserves the right to reject any proposal, cancel this solicitation, waive any informality associated with the bidding process and award the bid deemed most advantageous to the City.

Legal Provisions: This Statutes. contract letting shall be subject to the provisions of Section 62.15, 66.0903, and 779.15 of the Wisconsin

Bernard R. Rammer
Purchasing Agent

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ARTICLE 1 – DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the bid advertisement.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Architect/Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 Prospective Bidders are required to furnish or have on file a valid Bidder's Proof of Responsibility form (Form 00 45 13) with the City of Sheboygan Engineering Division not less than five (5) days prior to the time of opening of these bids. Forms for filing of such Proof of Responsibility are attached to the contract documents for the use of all interested bidders.

3.02 Said form shall fully develop the bidder's financial ability, adequacy of plant, equipment and organization, prior experience or competency to perform the work contemplated and other pertinent and material facts.

3.03 The City reserves the right to require separate Statements for bidding on each public contract. In no event shall this Statement of Bidder's Qualifications be used to qualify bidders for public contracts after one (1) year from Statement's date.

3.04 The City reserves the right to consider as unqualified any bidder that does not habitually perform, with his own forces, the major portions of the work under this contract and/or has performed unacceptable or substandard work for the City under previous City contracts.

3.05 A Bidder's failure to submit required qualification information within the times indicated will disqualify Bidder from bidding on the Contract.

3.06 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

3.07 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

4.01 Site and Other Areas

A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

4.02 Existing Site Conditions

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify:

a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.

b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

c. reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

d. Technical Data contained in such reports and drawings.

2. Engineer will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or adjacent to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

B. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

4.03 Site Visit and Testing by Bidders

A. Bidder shall conduct the required Site visit during normal working hours, and shall not disturb any ongoing operations at the Site.

B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing

so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.

D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

E. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.04 Other Work at the Site

A. Reference is made to Specification Section 01 11 00 –Summary of work in the Project Bidding Documents for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 5 – BIDDER'S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents;

B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;

D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;

E. consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;

F. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the

Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;

I. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and

J. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 6 – PRE-BID CONFERENCE

6.01 A mandatory pre-bid conference will be held at the time and location indicated in the Advertisement or invitation to bid. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are must attend and participate in the conference.

6.02 Information presented at the pre-Bid conference does not alter the Contract Documents. Owner will issue Addenda to make any changes to the Contract Documents that result from discussions at the pre-Bid conference. Information presented, and statements made at the pre-bid conference will not be binding or legally effective unless incorporated in an Addendum.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than three days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

ARTICLE 8 – BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a Bid bond (on the form included in the Bidding Documents) issued by a surety meeting the requirements of Paragraphs 6.01 and 6.02 of the General Conditions.

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Contract or 91 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within seven days after the Bid opening.

ARTICLE 9 – CONTRACT TIMES

9.01 The number of days within which, or the dates by which, Milestones, if identified are to be achieved and the Work is to be substantially completed, and completed and ready for final payment, are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal" item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.

11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.

12.03 Bidder shall submit with the bid a list of proposed subcontractors in accordance with Wisconsin Statute Section 66.0901(7). The list may not be added to nor altered with the written consent of the City.

12.04 The apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to the City a Non-Collusion Affidavit from each Subcontractor.

If City, after due investigation, has reasonable objection to any proposed Subcontractor, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

12.05 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor so listed and against which City makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

13.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.

13.03 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The partnership's address for receiving notices shall be shown.

13.04 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the firm's address for receiving notices shall be shown.

13.05 A Bid by an individual shall show the Bidder's name and address for receiving notices.

13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture's address for receiving notices shall be shown.

13.07 All names shall be printed in ink below the signatures.

13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers and dates of which shall be filled in on the Bid Form.

13.09 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

ARTICLE 14 – BASIS OF BID

14.01 Lump Sum

A. Bidders must submit a Bid on a lump sum basis as set forth in the Bid Form.

ARTICLE 15 – SUBMITTAL OF BID

15.01 The Bidding Documents include one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 8 of the Bid Form.

15.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.

15.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

15.04 Only Bidders qualified in accordance with Article 3 will be allowed to access the Quest Bid Worksheet.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

16.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.

16.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 – OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the bids have been reviewed.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.

19.02 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid. Only after authorization for such award is made by the City of Sheboygan Common Council, to whom all proposals will be referred for consideration, will the contract be awarded.

19.03 Evaluation of Bids

A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Worksheet or prior to the Notice of Award.

B. Bids will be evaluated and the low Bidder determined pursuant to Article 19:

1. If no Alternate is present, bids will be compared on the basis of the "Base Bid" and this amount will be the basis for determining the lowest Bidder.

2. If an Alternate is present, bids will be compared on the basis of the "Adjusted Base Bid" and this amount will be the basis for determining the lowest Bidder. The sum of the Total Base Bid and any combination of Alternates accepted by the Owner will determine the "Adjusted Base Bid."

19.04 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 20 – BONDS AND INSURANCE

20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

ARTICLE 21 – SIGNING OF AGREEMENT

21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

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ARTICLE 22 – FEDERAL PROVISIONS.

22.01 Refer to Section 00 43 43 – Wage Rates for the Federal Provisions Governing this Bid-Letting and Contract

ARTICLE 1 – THE PROJECT

The Project, of which the Work under the Bid is a part, is generally described as follows: **Sheboygan Senior Activity Center – Phase I Remodel, 1728 North 8th Street., Sheboygan WI 53801** for the City of Sheboygan, Wisconsin, City Bid Number: **2004-21.**

ARTICLE 2 – BID RECIPIENT

2.01 This Bid is submitted to:

City of Sheboygan
2026 New Jersey Ave
Sheboygan, WI 53081

2.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 3 – BIDDER'S ACKNOWLEDGEMENTS

3.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 4 – BIDDER'S REPRESENTATIONS

4.01 *In submitting this Bid, Bidder represents that:*

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	Addendum, Date
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2)

reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents,and confirms that the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 5 – BIDDER'S CERTIFICATION

5.01 *Bidder certifies that:*

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder is fully informed respecting the preparation and contents of the attached Bid and all of the pertinent circumstances respecting such Bid

C. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

D. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

E. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 5.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at

artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

F. The price or prices quoted in the attached bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the bidder or any of its agents, representatives, owners, employees or parties in interest, including this affiant.

ARTICLE 6 – BASIS OF BID

6.01 Lump Sum Bids

A. Bidder will complete the Work in accordance with the Contract Documents for the following lump sum (stipulated) price(s), together with any Unit Prices indicated in Paragraph 3.02:

1. Lump Sum Price (Single Lump Sum)

Lump Sum Bid Price	**$**

B. Bidder acknowledges that:

1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and

2. estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 7 – TIME OF COMPLETION

7.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates indicated in the Agreement.

7.02 Bidder accepts the provisions of the Agreement and paragraph 19.01 of the Supplementary Conditions as to liquidated damages.

ARTICLE 8 – ATTACHMENTS TO THIS BID

8.01 The following documents are submitted and made a condition of this Bid:

A. Required Bid security;

B. List of Subcontractors (Document 00 45 50).

ARTICLE 9 – DEFINED TERMS

9.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

(Continued on next page)

ARTICLE 10 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

_____

By:
[Signature] _____

[Printed name] _____
(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

_____

_____

_____

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

_____

BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER *(Name and Address)*:

SURETY *(Name, and Address of Principal Place of Business)*:

OWNER *(Name and Address)*:

BID

Bid Due Date:

Description *(Project Name— Include Location)*:

BOND

Bond Number:

Date:

Penal sum _____ $ _____

(Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER	**SURETY**
_____ (Seal)	_____ (Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature	Signature (Attach Power of Attorney)
_____	_____
Print Name	Print Name
_____	_____
Title	Title
Attest: _____	Attest: _____
Signature	Signature
Title	Title

Note: Addresses are to be used for giving any required notice.
Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation shall be null and void if:

3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

3.2 All Bids are rejected by Owner, or

3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

PART 1 – GENERAL

1.01 GENERAL

A. The Contractor and Subcontractors shall pay wages not less than the prevailing hourly wage rate for each classification of employee engaged on the Work as determined by the United States Department of Labor.

B. The prevailing wage law does not prohibit payment of more than the prevailing rate of wages nor does it limit the hours of Work that may be performed by any employee in any particular period of time.

C. The Contractor shall post a copy of the wage determination in a prominent place at the site of the Work where the employees can easily see it.

1.02 FEDERAL LABOR STANDARD PROVISIONS

A. Comply with the Federal Labor Standard Provision (HUD 4010) included after this section.

1.03 WAGE DETERMINATIONS

A. The rate schedule(s) included after this section are the prevailing rate(s) of hourly wage applicable to this Contract. The wage rate schedule(s) cannot be altered during the time the Contract is in force.

1.04 OTHER FEDERAL REQUIREMENTS

A. Comply with the Affirmative Action Requirements (EO 11246), Contract Language Requirements, and Equal Opportunity Clause (EO 11246) included after this section.
B. Comply with 24 CFR 75 (Section 3 Contract Requirements) included after this section.

1.05 SITE SIGNAGE REQUIREMENTS

A. A sign meeting the requirements as identified after this section is required to be constructed and placed at the worksite.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

END OF SECTION

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section l(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible, place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part

of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make such disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section l(b)(2)(B) of the Davis-bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section l(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

(ii) (a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i) except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at *http://www.dol.gov/esa/whd/forms/wh347instr.htm* or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149.)

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5 (a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph A.3.(ii)(b).

(d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph A.3.(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant ',to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by

the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract

6. Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs 1 through 11 in this paragraph A and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

7. Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. (i) Certification of Eligibility. By entering into this contract the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1 01 0, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Administration..... makes, utters or publishes any statement knowing the same to be false..... shall be fined not more than $5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act. The provisions of this paragraph B are applicable where the amount of the prime contract exceeds $100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in sub paragraph (1) of this paragraph.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

C. Health and Safety. The provisions of this paragraph C are applicable where the amount of the prime contract exceeds $100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96). 40 USC 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

"General Decision Number: WI20210016 07/09/2021

Superseded General Decision Number: WI20200016

State: Wisconsin

Construction Type: Building

Counties: Calumet, Outagamie, Sheboygan and Winnebago Counties in Wisconsin.

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate,if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021
1	05/07/2021
2	07/09/2021

ASBE0205-010 06/01/1998

	Rates	Fringes
Asbestos Removal worker/hazardous material handler Includes preparation, wetting, stripping, removal, scrapping vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not	$ 16.56	3.10

BOIL0107-001 01/01/2017

	Rates	Fringes
BOILERMAKER		
Boilermaker	$ 35.65	29.89
Small Boiler Repair (under 25,000 lbs/hr)	$ 26.91	16.00

BRWI0011-003 06/01/2020

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Plasterer, Tile Layer	$ 35.68	24.40

CARP0252-001 06/01/2016

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical work, Excluding Batt Insulation)		
CARPENTER & SOFT FLOOR LAYER	$ 33.56	18.00
MILLWRIGHT	$ 35.08	18.35
PILEDRIVERMAN	$ 34.12	18.00

* ELEC0494-003 06/01/2021

	Rates	Fringes
Sound & Communications		
Installer	$ 22.39	18.80
Technician	$ 32.49	20.26

Installation, testing, maintenance, operation and servicing of all sound, intercom, telephone interconnect, closed circuit TV systems, radio systems, background music systems, language laboratories, electronic carillion, antenna distribution systems, clock and program systems and low-voltage systems such as visual nurse call, audio/visual nurse call systems, doctors entrance register systems. Includes all wire and cable carrying audio, visual, data, light and radio frequency signals. Includes the installation of conduit, wiremold, or raceways in existing structures that have been occupied for six months or more where required for the protection of the wire or cable, but does not mean a complete conduit or raceway system. work covered does not include the installation of conduit, wiremold or any raceways in any new construction, or the installation of power supply outlets by means of which external electric power is supplied to any of the foregoing equipment or products

* ELEC0494-012 06/01/2021

CALUMET (New Holstein Twp.) & SHEBOYGAN COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 37.91	22.74

ELEC0577-002 06/01/2020

CALUMET (Except Township of New Holstein), OUTAGAMIE, AND WINNEBAGO COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 34.23	29.50%+10.00

ENGI0139-002 06/01/2020

	Rates	Fringes
OPERATOR: Power Equipment		
Group 1	$ 42.92	23.15
Group 2	$ 41.67	23.15
Group 3	$ 39.97	23.15
Group 4	$ 39.44	23.15
Group 5	$ 37.37	23.15
Group 6	$ 35.84	23.15

HAZARDOUS WASTE PREMIUMS:
EPA Level ""A"" Protection: $3.00 per hour
EPA Level ""B"" Protection: $2.00 per hour
EPA Level ""C"" Protection: $1.00 per hour

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of over 100 tons; Cranes, Tower Cranes, and Derricks with boom, leads and/or jib lengths 176 ft or longer.

GROUP 2: Backhoes (Excavators) weighing 130,000 lbs & over; Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or less; Cranes, Tower Cranes, and Derricks with boom, leads, and/or jib lengths 175 ft or less; Caisson Rigs; Pile Driver

GROUP 3: Backhoes (Excavators) weighing under 130,000 lbs; Travelling Crane (bridge type); Milling Machine; Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Laser Screed; Concrete Grinder and Planing Machine; Slipform Curb and Gutter Machine; Boring Machine (Directional); Dredge Operator; Skid Rigs; Over 46 meter Concrete Pump.

GROUP 4: Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 10 tons or less; Tractor, Bulldozer, or End Loader (over 40 hp); Motor Patrol; Scraper Operator; Bituminous Plant and Paver Operator; Screed-Milling Machine; Roller over 5 tons; Concrete Pumps 46 meter & under; Grout Pumps; Rotec Type Machine; Hydro Blaster, 10,000 psi and over; Rotary Drill Operator; Percussion Drilling Machine; Air Track Drill with or without integral hammer; Blaster; Boring Machine (vertical or horizontal); Side Boom; Trencher, wheel type or chain type having 8 inch or larger bucket; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Straddle Carrier; Material Hoists; Stack Hoist; Man Hoists; Mechanic and Welder; Off Road Maaerial Haulers

GROUP 5: Tractor, Bulldozer, or Endloader (under 40 hp); Tampers -Compactors, riding type; Stump Chipper, large;

Roller, Rubber Tire; Backfiller; Trencher, chain type (bucket under 8 inch); Concrete Auto Breaker, large; Concrete Finishing Machine (road type); Concrete Batch Hopper; Concrete Conveyor Systems; Concrete Mixers, 14S or over; Pumps, Screw Type and Gypsum); Hydrohammers, small; Brooms and Sweeeprs; Lift Slab Machine; Roller under 5 tons; Industrial Locomotives; Fireman (Pile Drivers and Derricks); Pumps (well points); Hoists, automatic; A-Frames and Winch Trucks; Hoists (tuggers); Boats (Tug, Safety, Work Barges and Launches); Assistant Engineer

GROUP 6: Shouldering Machine Operator; Farm or Industrial Tractor mounted equipment; Post Hole Digger; Auger (vertical and horizontal); Skid Steer Loader with or without attachments; Robotic Tool Carrier with or without attachments; Power Pack Vibratory/Ultra Sound Driver and Extractor; Fireman (Asphalt Plants); Screed Operator; Stone Crushers and Screening Plants; Air, Electric, Hydraulic Jacks (Slip Form); Prestress Machines; Air Compressor, 400 CFM or over; Refrigeration Plant/Freese Machine; Boiler Operators (temporary heat); Forklifts; Welding Machines; Generators; Pumps over 3""; Compressors, under 400 CFM; Heaters, Mechanical; Combination small equipment operator; Winches, small electric; Oiler; Greaser; Rotary Drill Tender; Conveyor; Elevator Operator

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* IRON0008-001 06/01/2021

	Rates	Fringes
IRONWORKER	$ 38.77	28.15

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

LABO0330-004 06/01/2020

	Rates	Fringes
Asbestos Abatement/Hazardous Waste (Preparation, removal and Encapsulation of hazardous materials from non-mechanical systems)	$ 29.00	17.88
Laborer, General	$ 29.30	17.88

NOTE: Mason Tender $.25 over general laborer.

PAIN0802-008 06/01/2019

	Rates	Fringes
PAINTER		
Brush, Drywall Taper	$ 30.93	18.58

PAIN1204-001 06/01/2017

	Rates	Fringes
GLAZIER	$ 28.34	19.65

PLUM0400-001 06/04/2018

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)		
(1) Small buildings (except industrial and power plants) where plumbing or heating is $50,000 or less	$ 32.15	17.57
(2) All other work	$ 36.74	19.06

SFWI0669-002 04/01/2021

	Rates	Fringes
SPRINKLER FITTER	$ 43.87	25.41

SHEE0018-025 09/01/2020

CALUMET & SHEBOYGAN COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC duct work and Technician)	$ 35.71	27.02

SHEE0018-029 06/01/2020

OUTAGAMIE AND WINNEBAGO COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC duct work and Technician)	$ 37.51	25.96

* TEAM0662-001 06/01/2021

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 32.57	23.81
3 or more Axles	$ 32.72	23.81

SUWI2002-013 01/23/2002

	Rates	Fringes
Asbestos Worker/Heat and Frost Insulator	$ 25.36	8.37
Laborers:		
Concrete Worker	$ 16.34	3.59
Landscape	$ 8.73	4.90
ROOFER	$ 18.01	3.28
Tile & Marble Finisher	$ 13.89	8.36

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave

for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average

calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

"General Decision Number: WI20210016 07/09/2021

Superseded General Decision Number: WI20200016

State: Wisconsin

Construction Type: Building

Counties: Calumet, Outagamie, Sheboygan and Winnebago Counties in Wisconsin.

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.95 for calendar year 2021 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.95 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2021. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate,if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/01/2021
1	05/07/2021
2	07/09/2021

ASBE0205-010 06/01/1998

	Rates	Fringes
Asbestos Removal worker/hazardous material handler Includes preparation, wetting, stripping, removal, scrapping vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not	$ 16.56	3.10

BOIL0107-001 01/01/2017

	Rates	Fringes
BOILERMAKER		
Boilermaker	$ 35.65	29.89
Small Boiler Repair (under 25,000 lbs/hr)	$ 26.91	16.00

BRWI0011-003 06/01/2020

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Plasterer, Tile Layer	$ 35.68	24.40

CARP0252-001 06/01/2016

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical work, Excluding Batt Insulation)		
CARPENTER & SOFT FLOOR LAYER	$ 33.56	18.00
MILLWRIGHT	$ 35.08	18.35
PILEDRIVERMAN	$ 34.12	18.00

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* ELEC0494-003 06/01/2021

	Rates	Fringes
Sound & Communications		
Installer	$ 22.39	18.80
Technician	$ 32.49	20.26

Installation, testing, maintenance, operation and servicing of all sound, intercom, telephone interconnect, closed circuit TV systems, radio systems, background music systems, language laboratories, electronic carillion, antenna distribution systems, clock and program systems and low-voltage systems such as visual nurse call, audio/visual nurse call systems, doctors entrance register systems. Includes all wire and cable carrying audio, visual, data, light and radio frequency signals. Includes the installation of conduit, wiremold, or raceways in existing structures that have been occupied for six months or more where required for the protection of the wire or cable, but does not mean a complete conduit or raceway system. work covered does not include the installation of conduit, wiremold or any raceways in any new construction, or the installation of power supply outlets by means of which external electric power is supplied to any of the foregoing equipment or products

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* ELEC0494-012 06/01/2021

CALUMET (New Holstein Twp.) & SHEBOYGAN COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 37.91	22.74

ELEC0577-002 06/01/2020

CALUMET (Except Township of New Holstein), OUTAGAMIE, AND WINNEBAGO COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 34.23	29.50%+10.00

ENGI0139-002 06/01/2020

	Rates	Fringes
OPERATOR: Power Equipment		
Group 1	$ 42.92	23.15
Group 2	$ 41.67	23.15
Group 3	$ 39.97	23.15
Group 4	$ 39.44	23.15
Group 5	$ 37.37	23.15
Group 6	$ 35.84	23.15

HAZARDOUS WASTE PREMIUMS:
EPA Level ""A"" Protection: $3.00 per hour
EPA Level ""B"" Protection: $2.00 per hour
EPA Level ""C"" Protection: $1.00 per hour

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of over 100 tons; Cranes, Tower Cranes, and Derricks with boom, leads and/or jib lengths 176 ft or longer.

GROUP 2: Backhoes (Excavators) weighing 130,000 lbs & over; Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or less; Cranes, Tower Cranes, and Derricks with boom, leads, and/or jib lengths 175 ft or less; Caisson Rigs; Pile Driver

GROUP 3: Backhoes (Excavators) weighing under 130,000 lbs; Travelling Crane (bridge type); Milling Machine; Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Laser Screed; Concrete Grinder and Planing Machine; Slipform Curb and Gutter Machine; Boring Machine (Directional); Dredge Operator; Skid Rigs; Over 46 meter Concrete Pump.

GROUP 4: Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 10 tons or less; Tractor, Bulldozer, or End Loader (over 40 hp); Motor Patrol; Scraper Operator; Bituminous Plant and Paver Operator; Screed-Milling Machine; Roller over 5 tons; Concrete Pumps 46 meter & under; Grout Pumps; Rotec Type Machine; Hydro Blaster, 10,000 psi and over; Rotary Drill Operator; Percussion Drilling Machine; Air Track Drill with or without integral hammer; Blaster; Boring Machine (vertical or horizontal); Side Boom; Trencher, wheel type or chain type having 8 inch or larger bucket; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Straddle Carrier; Material Hoists; Stack Hoist; Man Hoists; Mechanic and Welder; Off Road Maaerial Haulers

GROUP 5: Tractor, Bulldozer, or Endloader (under 40 hp); Tampers -Compactors, riding type; Stump Chipper, large;

Roller, Rubber Tire; Backfiller; Trencher, chain type (bucket under 8 inch); Concrete Auto Breaker, large; Concrete Finishing Machine (road type); Concrete Batch Hopper; Concrete Conveyor Systems; Concrete Mixers, 14S or over; Pumps, Screw Type and Gypsum); Hydrohammers, small; Brooms and Sweeeprs; Lift Slab Machine; Roller under 5 tons; Industrial Locomotives; Fireman (Pile Drivers and Derricks); Pumps (well points); Hoists, automatic; A-Frames and Winch Trucks; Hoists (tuggers); Boats (Tug, Safety, Work Barges and Launches); Assistant Engineer

GROUP 6: Shouldering Machine Operator; Farm or Industrial Tractor mounted equipment; Post Hole Digger; Auger (vertical and horizontal); Skid Steer Loader with or without attachments; Robotic Tool Carrier with or without attachments; Power Pack Vibratory/Ultra Sound Driver and Extractor; Fireman (Asphalt Plants); Screed Operator; Stone Crushers and Screening Plants; Air, Electric, Hydraulic Jacks (Slip Form); Prestress Machines; Air Compressor, 400 CFM or over; Refrigeration Plant/Freese Machine; Boiler Operators (temporary heat); Forklifts; Welding Machines; Generators; Pumps over 3""; Compressors, under 400 CFM; Heaters, Mechanical; Combination small equipment operator; Winches, small electric; Oiler; Greaser; Rotary Drill Tender; Conveyor; Elevator Operator

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* IRON0008-001 06/01/2021

	Rates	Fringes
IRONWORKER	$ 38.77	28.15

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

LABO0330-004 06/01/2020

	Rates	Fringes
Asbestos Abatement/Hazardous Waste (Preparation, removal and Encapsulation of hazardous materials from non-mechanical systems)	$ 29.00	17.88
Laborer, General	$ 29.30	17.88

NOTE: Mason Tender $.25 over general laborer.

PAIN0802-008 06/01/2019

	Rates	Fringes
PAINTER		
Brush, Drywall Taper	$ 30.93	18.58

PAIN1204-001 06/01/2017

	Rates	Fringes
GLAZIER	$ 28.34	19.65

PLUM0400-001 06/04/2018

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)		
(1) Small buildings (except industrial and power plants) where plumbing or heating is $50,000 or less	$ 32.15	17.57
(2) All other work	$ 36.74	19.06

SFWI0669-002 04/01/2021

	Rates	Fringes
SPRINKLER FITTER	$ 43.87	25.41

SHEE0018-025 09/01/2020

CALUMET & SHEBOYGAN COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC duct work and Technician)	$ 35.71	27.02

SHEE0018-029 06/01/2020

OUTAGAMIE AND WINNEBAGO COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC duct work and Technician)	$ 37.51	25.96

* TEAM0662-001 06/01/2021

	Rates	Fringes
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Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average

calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
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On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

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Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

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The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

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200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION"

AFFIRMATIVE ACTION REQUIREMENTS (EO 11246)

(Applicable to construction contracts/subcontracts exceeding $10,000)

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

   Goals for Women = **6.9 percent** (this goal applies nationwide)

   Goals for minority participation = 7.0 (this goal applies county-wide)

   (Insert goals – see next page**)**

   These goals are applicable to all the contractor's construction work (whether or not it is federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographic are located outside of the covered area, it shall apply the goals established for such geographic area where the work is actually performed. The contractor is also subject to the goals for both its federal and nonfederal construction.

3. The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3 (a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from contractor to contractor or from project to project for the sole purpose of meeting the contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

4. The contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

   As used in this notice, and in the contract resulting from this solicitation, the "covered area" is a description of the geographical areas where the contract is to be performed indicating the state, county and city, if any.

CONTRACT LANGUAGE REQUIREMENTS

(Applicable to all contracts exceeding $100,000 where the CDBG contract exceeds $200,000)

Include the following language **in all contracts and subcontracts:**

1. Section 3 of the Housing and Urban Development Act of 1968. The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

2. The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement Section 3. As evidence by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulation.

3. The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this Section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship, and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

4. The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

5. The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

6. Non-compliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

7. With respect to work performed in connection with Section 3 covered Indian housing assistance, Section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible: (i) preference and opportunities for training and employment shall be given to Indians; and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-Owned Economic Enterprises. Parties to this contract that are subject to the provisions of Section 3 and Section 7(b) agree to comply with Section 3 to maximum extent feasible, but not in derogation of compliance with section 7(b).

EQUAL OPPORTUNITY CLAUSE (EO 11246)
(FOR CONTRACTORS)

During the performance of this contract, the contractor agrees as follows:

1. The contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed and that employees are treated, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination, rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

2. The contractor shall, in all solicitations or advertisement for employees placed by or on behold of the contractor, state that all qualified applicants will receive consideration without regard to race, color, religion, sex, or national origin.

3. The contractor shall send to each labor union or representative of workers with which he/she has a collective bargaining agreement or other contract or understanding, a notice to be provided by the Contract Compliance Officer advising the said labor union or workers' representatives of the contractor's commitment under this section, and shall post copies of the notice in conspicuous place available to employees and applicants for employment.

4. The contractor shall comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations and relevant orders of the Secretary of Labor.

5. The contractor shall furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the Department of Commerce and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and others.

6. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, the contract may be canceled, terminated or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965 or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.

7. The contractor shall include the provisions of paragraphs 1 through 7 in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as Commerce may direct as a means of enforcing such provisions, including

sanctions for noncompliance. Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by Commerce, the contractor may request the United States to enter into such litigation to protect the interest of the United States.

Civil Rights Act of 1964. Under Title VI of the Civil Rights Act of 1964, no person shall, on the grounds of race, color or national origin, be excluded from participation in, be denied the benefits, or be subjected to discrimination under any program or activity receiving federal financial assistance.

Section 109 of the Housing and Community Development Act of 1974. No person in the United States shall, on the ground of race, color, national origin, sex, age or handicap be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title.

SECTION 3 CONTRACT REQUIREMENTS [24 CFR 75]

*(24 CFR 75 is applicable to HUD-funded projects awarded **ON or AFTER** to November 30, 2020)*

Insertion in *all* contracts and sub-contracts funded with Community Development Block Grant (CDBG) dollars:**

1. **Section 3 of the Housing and Urban Development Act of 1968:** The work to be performed under this contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (Section 3). The purpose of Section 3 is to ensure that employment and other economic opportunities generated by the U.S. Department of Housing and Urban Development (HUD) assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.
2. **Contractor Certification of Compliance:** The parties to this contract agree to comply with HUD's regulations in 24 CFR 75, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the 24 CFR 75 regulations.
3. **Contract Language Requirement:** The contractor agrees to include this *Section 3 Contract Requirements* clause in every sub-contract subject to compliance with regulations in 24 CFR 75, and agrees to take appropriate action, as provided in an applicable provision of the sub-contractor in this *Section 3 Contract Requirements* clause, upon a finding that the sub-contractor is in violation of the regulations in 24 CFR 75. The contractor will not sub-contract with any sub-contractor where the contractor has notice or knowledge that the sub-contractor has been found in violation of the regulations in 24 CFR 75.
4. **Contracting Requirements:** To the greatest extent feasible, and consistent with existing Federal, state, and local laws and regulations, the CDBG Grantee *and* contractors and sub-contractors for the CDBG project shall ensure contracts and sub-contracts for work awarded in connection with the project are awarded to business concerns that provide economic opportunities to Section 3 Workers; and where feasible in the following order of priority: (1) Section 3 Business concerns that provide economic opportunities to Section 3 Workers residing within the metropolitan area (or nonmetropolitan county) in which the HUD funded assistance is provided/in which the HUD funded/CDBG project is occurring; and (2) YouthBuild programs.
5. **Employment and Training Requirements:** To the greatest extent feasible, and consistent with existing Federal, state, and local laws and regulations, the CDBG Grantee *and* contractors and sub-contractors for the CDBG project shall ensure employment and training opportunities generated in connection with the project are filled by Section 3 Workers; and where feasible, in the following order of priority: (1) low- and very low-income persons residing within the metropolitan area (or nonmetropolitan county) in which the CDBG assistance is expended (i.e., in which the CDBG project is occurring); and (2) participants in YouthBuild programs.
6. **Section 3 Definitions [24 CRF 75]:** Definitions for Section 3 terms per 24 CFR 75 are as follows:
   Section 3 Worker: An employee who currently fits (if hired more than five (5) years before starting work on the CDBG project), or fit at the time of hire (if hired within five (5) years of starting work on the CDBG project), at least one (1) of the following categories: (1) is employed by a Section 3 Business concern; or (2) is a low- or very low-income resident (i.e., a local person living within the Section 3 service area as defined in 24 CFR 75.5, with an *individual* annualized income at the time of hire (if hired within five (5) years of starting work on the CDBG project), or currently as of date of starting work on the project (if hired more than five (5) years before starting work on the CDBG project) that was/is at or below the low-income (80%) threshold established by HUD for a Family of 1 for the county in which the person lives) [Note: The HUD income threshold must be from the HUD Income Limits for the CDBG program that are in effect at the time of hire (if hired within five (5) years of starting work on the CDBG project), or currently in effect as of the date the worker started work on the CDBG project (if hired more than five (5) years prior to starting work on the CDBG project). The HUD Income Limits are updated annually, typically in March or April.]; or (3) is a YouthBuild participant.
   Targeted Section 3 Worker: An employee who is employed by a Section 3 Business concern; or who currently fits (or when hired fit) at least one (1) of the following categories as documented within the past five (5) years: (1) lives/lived within the Section 3 service area or the neighborhood of the CDBG project as defined in 24 CFR 75.5; or (2) is a YouthBuild participant.
   Section 3 Business concern: A business that fits at least one (1) of the following categories: (1) 51% or more owned by low- or very low-income persons; or (2) 75% or more of the labor hours are performed by low- or very low-income persons; or (3) 51% or more owned by current residents of public housing or Section 8-assisted housing.
   Section 3 Service Area: An area within one (1) mile of the CDBG project's location (i.e., street address); or an area within a circle centered around the CDBG project site that encompasses 5,000 people [if less than 5,000 people live within a one (1) mile radius of the CDBG project site].

   Reporting Labor Hours: CDBG Grantee *and* contractors and sub-contractors for the CDBG project shall report all worker (see exception on next page)* labor hours on the project as follows: (1) the total number of labor hours worked; (2) the total number of labor hours worked by Section 3 Workers; and (3) the total number of labor hours worked by Targeted Section 3 Workers. The labor hours reported shall include the total number of labor hours worked on the financially assisted project by workers employed by the CDBG Grantee, *and* employed by their contractors and sub-contractors, during the reporting period specified by HUD and the State CDBG Program. The labor hours reported may be based on the employer's good faith assessment of the labor hours of a full-time or part-time employee informed by the employer's existing salary or time and attendance based payroll systems, unless the project or activity is otherwise subject to requirements specifying time and attendance reporting. [Note: Construction contractors required to maintain certified payroll records to meet federal labor standards requirements shall report actual work hours as reported on the certified payroll records.]
   **Exception for positions that require an advanced degree or professional certification: Reporting of hours for positions requiring an advanced degree or professional certification is not required, but the hours may be reported to demonstrate Section 3 "best efforts". The CDBG Grantee, contractors and sub-contractors may report the labor hours by Section 3 Workers and Targeted Section 3 Workers without including labor hours from employees in positions requiring an advanced degree or professional certification in the total number of labor hours worked, but if the contract covers both work requiring an advanced degree or professional certification and other work, the labor hours for the other work under the contract that are not from employees in positions requiring an advanced degree or professional certification must still be reported.*

7. **Section 3 Benchmarks:** The HUD Section 3 Final Rule (24 CFR 75) establishes "**safe harbor**" benchmarks that are quantitative benchmarks and prioritized qualitative efforts that funding recipients must complete to assist low- and very low-income persons with employment and training opportunities: (1) 25% or more of all labor hours worked must be worked by Section 3 Workers; and (2) 5% or more of all labor hours worked must be worked by Targeted Section 3 Workers. If the "safe harbor" benchmarks are not met over the course of the project, then the CDBG Grantee *and* contractors and sub-contractors for the CDBG project shall provide evidence of completing qualitative efforts to assist low- and very low-income persons with employment and training opportunities. Supporting documentation of these completed efforts must also be maintained in the CDBG Grantee's and contractors' CDBG project files, to be made available upon request for monitoring purposes.
8. **Demonstrating Best Efforts:** When the Section 3 benchmarks are not met, the CDBG Grantee *and* contractors and sub-contractors for the CDBG project shall demonstrate and report qualitative efforts made in an attempt to meet the benchmarks, which may include but are not limited to the following:
   (1) Engage in outreach efforts to generate job applicants who are Targeted Section 3 Workers.
   (2) Provide training or apprenticeship opportunities.
   (3) Provide technical assistance to help Section 3 Workers compete for jobs (e.g., resume assistance, coaching).
   (4) Provide or connect Section 3 Workers with assistance in seeking employment including: drafting resumes, preparing for interviews, and finding job opportunities connecting residents to job placement services.
   (5) Hold one or more job fairs.
   (6) Provide or refer Section 3 Workers to services supporting work readiness and retention (e.g., work readiness activities, interview clothing, test fees, transportation, child care).
   (7) Provide assistance to Section 3 Workers to apply for/or attend community college, a four-year educational institution, or vocational/technical training.
   (8) Assist Section 3 Workers to obtain financial literacy training and/or coaching.
   (9) Engage in outreach efforts to identify and secure bids from Section 3 Business concerns.
   (10) Provide technical assistance to help Section 3 Business concerns understand and bid on contracts.
   (11) Divide contracts into smaller jobs to facilitate participation by Section 3 Business concerns.
   (12) Provide bonding assistance, guaranties, or other efforts to support viable bids from Section 3 Business concerns.
   (13) Promote use of business registries designed to create opportunities for disadvantaged and small businesses.
   (14) Conduct outreach, engagement, or referrals with the state one-stop system as defined in Section 121(e)(2) of the Workforce Innovation and Opportunity Act.
9. **Recordkeeping & Reporting:** The CDBG Grantee *and* contractors and sub-contractors for the CDBG project shall maintain all records demonstrating compliance with 24 CFR 75, including contracting information and documents, worker income certifications (for Section 3 Worker status determinations), and worker labor hours on CDBG project; *and* provide data and reporting documents as requested and required by the State CDBG Program and/or HUD. Grantee and contractor records may be monitored for compliance by the State CDBG Program and/or HUD.
10. **Non-Compliance:** Non-compliance with HUD's regulations in 24 CFR 75 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.
11. **Indian Housing Assistance Project Specifications:** With respect to work performed in connection with Section 3 covered Indian housing assistance, Section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible: (i) preference and opportunities for training and employment shall be given to Indians; and (ii) preference in the award of contracts and sub-contracts shall be given to Indian organizations and Indian-Owned Economic Enterprises. Parties to this contract that are subject to the provisions of Section 3 and Section 7(b) agree to comply with Section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

** *This language is **required** **to be included in contracts and sub-contracts for the HUD funded project that are funded in whole or in part with the federal dollars.** It is **strongly recommended** **to be included in ALL contracts and sub-contracts for the HUD funded project,** regardless of the funding source, to help avoid issues with compliance and reporting later in the project cycle if the funding source changes.*

Community Development Block Grant Program

MAYOR, RYAN SORENSON
CITY OF SHEBOYGAN, WISCONSIN

UPTOWN SOCIAL RENOVATION
SHEBOYGAN'S FUTURE HUB FOR ACTIVE SENIORS

1817 N. 8th Street,

Sheboygan, Wisconsin

Architect/Engineer: Groth Design Group/Department of Public Works

Contractor:

This project is funded by a Community Development Block Grant administered by the City of Sheboygan's Department of Planning and Development and financed by a U.S. Department of Housing and Urban Development Section 108 Loan Guarantee Program.

Equal Opportunity Employer

Sign Dimensions: 1200mm x 2400mm x 19 mm (app. 4' x 8' x ¾") Plywood Panel (APA Rated A-B grade – Exterior)

CITY OF SHEBOYGAN

BIDDER'S PROOF OF RESPONSIBILITY

This proof of Responsibility is required
pursuant to Section 66.0901 of the Wisconsin Statutes.

**(Must be filed with the Engineering Division
not less than <u>five (5) days prior</u>
to the time set for opening of bids.)**

This form should be submitted to:

City of Sheboygan
Engineering Department
Municipal Service Building
2026 New Jersey Avenue
Sheboygan WI 53081

NOTE: The contents of this questionnaire shall be confidential for the exclusive use of the contracting agency and shall not be made public except by written permission of the prospective bidder.

BIDDER'S PROOF OF RESPONSIBILITY

The contents of this questionnaire will be considered confidential.

If the Engineering Division is not satisfied with the sufficiency of the answers to the questionnaire and financial statement, it may reject the bid or disregard the same or require additional information.

The City reserves the right to require separate Statements for bidding on each public contract. In no event shall this Statement of Bidder's Qualifications be used to qualify bidders for public contracts after one (1) year from this Statement's date.

STATEMENT OF BIDDER'S QUALIFICATIONS

1. Name of Bidder _____
   _____ Corporation _____ Partnership _____ Individual

2. Bidder's Address _____

   City _____ State/Zip _____

   Phone No. _____ FAX No. _____

   E-Mail Address _____

3. When organized? _____ Where incorporated? _____

4. How many years have you been engaged in the contracting business under the present firm name? _____

5. Contracts on hand (Show present contracts, including a schedule as to estimated completion date and gross amount of each contract.

Date Awarded	Type of Work	Percent Completed	Anticipated Completion Date	Cost of Work

(If additional space is required, file separate sheet with details.)

6. General character of work performed by your firm.

(If additional space is required, file separate sheet with details.)

7. Have you ever failed to complete any work awarded to you?
   _____ Yes _____ No

   If so, attach a statement explaining where and why.

8. Have you ever defaulted on a contract? _____ Yes _____ No

   If so, explain where and why.

(If additional space is required, file separate sheet with details.)

9. List your major equipment.

(If additional space is required, file separate sheet with details.)

10. List your experience in the construction of work similar in importance to this project.

(If additional space is required, file separate sheet with details.)

11. Show background and experience of the principal members of your personnel including the officers.

Name	Position Held or Office Held	Years of Construction Experience	Magnitude and Type of Work	Capacity

(If additional space is required, file separate sheet with details.)

12. Credit available. Furnish written evidence, preferably from banks.

13. Financial Statement:

Condition at Close of Business on _____ , _____.

Assets:

a. Cash _____

b. Accounts Receivable _____

c. Real Estate Equity _____

d. Materials in Stock _____

e. Equipment, Book Value _____

f. Furniture & Fixtures Book Value _____

g. Other Assets _____

TOTAL ASSETS $_____

Liabilities:

h. Accounts, Notes & Interest Payable _____

i. Other Liabilities _____

TOTAL LIABILITIES $_____

NET WORTH **$**_____

14. Additional information may be submitted if desired.

Dated at _____ this _____ day of _____, _____ .

NAME OF ORGANIZATION

BY _____

TITLE _____

State of _____

County of _____

_____ being duly sworn says that he is

_____ of _____
(Organization)

and that the answers of the foregoing questions and all statements contained are true and correct.

Signed _____

Subscribed and sworn to before me this _____ day of _____, _____ .

_____ Notary Public

My commission expires _____

Project Name: **Sheboygan Senior Activity Center – Phase I Remodel, 1728 North 8th Street., Sheboygan WI 53801**

List proposed subcontractors below. If no subcontractors are proposed check the box next to "No Subcontractors". This form is still required to be submitted if no Subcontractors are proposed. Add Additional sheets as may be necessary.

☐ No Subcontractors.

Name of Proposed Subcontractors			Class of Work
1	Name:		
	Address:	Federal ID#:	
2	Name:		
	Address:	Federal ID#:	
3	Name:		
	Address:	Federal ID#:	
4	Name:		
	Address:	Federal ID#:	
5	Name:		
	Address:	Federal ID#:	
6	Name:		
	Address:	Federal ID#:	
	Address:		

AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between City of Sheboygan ("Owner") and //Contractor// ("Contractor").

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: Existing building renovation.

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: Sheboygan Senior Activity Center – Phase I Remodel, 1728 North 8th Street., Sheboygan WI 53801 for the City of Sheboygan, Wisconsin, City Bid Number: 2004-21

2.02 City of Sheboygan Resolution:

2.03 City of Sheboygan Account Number:

ARTICLE 3 – ARCHITECT/ENGINEER

3.01 The part of the Project that pertains to the Work has been designed by Building: Groth Design Group (Designer), Site: the City of Sheboygan.

3.02 The Engineering Division, Department of Public Works, City of Sheboygan, Sheboygan, WI will assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Dates*

A. The Work will be substantially completed on or before June 1, 2022 and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the 14th day following substantial completion.

4.03 *Milestones*

A. Parts of the Work must be substantially completed on or before the following Milestone(s):

1. None

4.04 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner the amount identified in paragraph 19.01 of the Supplementary Conditions for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.

2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner the amount identified in paragraph 19.01 of the Supplementary Conditions for each day that expires after such time until the Work is completed and ready for final payment.

3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

4. Milestones: Contractor shall pay Owner the amount identified in paragraph 19.01 of the Supplementary Conditions for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of each Milestone, until Milestone is achieved.

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

4.05 *Special Damages*

C. In addition to the amount provided for liquidated damages, Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.

D. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

A. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item) as stated in Contractor's Bid, attached hereto as an exhibit.

B. The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on the third Wednesday of the Month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract

a. 95 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

b. 0 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

6.04 *Interest*

A. All amounts not paid when due shall bear interest at the rate of 0 percent per annum.

ARTICLE 7 – CONTRACT DOCUMENTS

7.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement.
2. Bonds:
    a. Performance.
    b. Payment bond.
3. Specifications as listed in the table of contents of the project manual (copy of list attached and incorporated by reference).
4. Drawings as listed in the table of contents of the drawings (copy of list attached and incorporated by reference).
5. Federal Labor Provisions (HUD 4010), Wage Determinations, Affirmative Action Requirements, Contract Language Requirements, Equal Opportunity Clause and Section3 Contract Requirements as identified in Section 00 43 43 – Federal Requirements (not attached but incorporated by reference)
6. Addenda (not attached but incorporated by reference)
    a. Number **{Number}** dated **{Date}**.
    b. Number **{Number}** dated **{Date}**.
    c. Number **{Number}** dated **{Date}**.
7. Exhibits to this Agreement (enumerated as follows):
    a. Contractor's Bid consisting of **{Total Pages}**.
8. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    a. Notice to Proceed,
    b. Work Change Directives,
    c. Change Orders,
    d. Field Order,
    e. Task Orders.

B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 7.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8 – ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 *Contractor's Representations*

A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:

1. Contractor has examined and carefully studied the Contract Documents, including Addenda.

2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.

5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.

6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

8.02 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 *Standard General Conditions*

A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

(Continued on next page)

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

OWNER:

City of Sheboygan

By: _____
(signature)

Name,
Title: Ryan Sorenson, Mayor

Date: _____

Attest:

By: _____
(signature)

Name,
Title: Meredith DeBruin, City Clerk

Date: _____

Signatures authorized pursuant to Res. ___-21-22.

Address for giving notices:
City of Sheboygan – Engineering Division
2026 New Jersey Avenue
Sheboygan, WI 53081

Approved as to form and Execution:

By: _____
(signature)

Name, Charles C. Adams, City Attorney
Title:

Date: _____

CONTRACTOR:

{Contractor}_____

By: _____
(signature)

Name,
Title: _____
(printed)

Date: _____

(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Address for giving notices:

_____

_____

_____

Project Name: Sheboygan Senior Activity Center – Phase I Remodel

Bid Number: 2004-21

Contractor: Click here to enter text.

TO CONTRACTOR:

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on [_____, 20__]. *[see Paragraph 4.01 of the General Conditions]*

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work shall be done at the Site prior to such date. In accordance with the Agreement, [the date of Substantial Completion is _____, and the date of readiness for final payment is_____] and the number of days to achieve readiness for final payment is _____].

Before starting any Work at the Site, Contractor must comply with the following:

[Note any access limitations, security procedures, or other restrictions]

By: _____
Engineer/Project Manager

Title: _____

Date: _____

EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

PERFORMANCE BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

CONSTRUCTION CONTRACT
Effective Date of the Agreement:
Amount:
Description *(name and location)*:

BOND
Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ *(seal)*
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

_____ *(seal)*
Surety's Name and Corporate Seal

By: _____
Signature *(attach power of attorney)*

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

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10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

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EJCDC
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*:

CONSTRUCTION CONTRACT

Effective Date of the Agreement:
Amount:
Description *(name and location)*:

BOND

Bond Number:
Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:
Amount:
Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

_____ *(seal)*
Contractor's Name and Corporate Seal

By: _____
Signature

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

SURETY

_____ *(seal)*
Surety's Name and Corporate Seal

By: _____
Signature *(attach power of attorney)*

_____
Print Name

_____
Title

Attest: _____
Signature

_____
Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond shall arise after the following:

   5.1 Claimants who do not have a direct contract with the Contractor,

      5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

      5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).

   5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

   7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

   7.2 Pay or arrange for payment of any undisputed amounts.

   7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

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12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. **Definitions**

16.1 **Claim:** A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 **Claimant:** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 **Construction Contract:** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 **Owner Default**: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 **Contract Documents:** All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond are as follows:

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DATE: Click here to enter a date.

CITY BID NUMBER: Click here to enter text.

SUBMITTAL #: Click here to enter text.

PROJECT TITLE: Click here to enter text.

SUBMITTED BY: Click here to enter text.

CONTRACTOR: Click here to enter text.

SPECIFICATION SECTION OR DRAWING NUMBER:

Click here to enter text.

DESCRIPTION OF ITEMS INCLUDED IN SUBMITTAL:

Click here to enter text.

DOCUMENTS ATTACHED: ☐ Shop Drawings ☐ Product Data ☐ Test Results ☐ Other

COMMENTS:

Click here to enter text.

Contractor's Application for Payment No.

	Application Period:	Application Date:
To	From (Contractor):	Via (Engineer): N/A
Project:	City Bid Number:	Contractor's Project No.:

Application For Payment

Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. **ORIGINAL CONTRACT PRICE..... $** _____
2. **Net change by Change Orders..... $** _____
3. **Current Contract Price (Line 1 ± 2)..... $** _____
4. **TOTAL COMPLETED AND STORED TO DATE**
   (Column F total on Progress Estimates)..... $ _____
5. **RETAINAGE:**
   - **a. 5% X** _____ **Work Completed..... $** _____
   - **b. X** _____ **Stored Material..... $** _____
   - **c. Total Retainage (Line 5.a + Line 5.b)..... $** _____
6. **AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5.c)..... $** _____
7. **LESS PREVIOUS PAYMENTS (Line 6 from prior Application)..... $** _____
8. **AMOUNT DUE THIS APPLICATION..... $** _____
9. **BALANCE TO FINISH, PLUS RETAINAGE**
   (Column G total on Progress Estimates + Line 5.c above)..... $ _____

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:
(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;
(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all Liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such Liens, security interest, or encumbrances); and
(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor Signature

By:	Date:

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ _____
(Engineer/Project Manager) (Date)

Payment of: $ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ _____
(City of Sheboygan) (Date)

Progress Estimate - Unit Price Work

Contractor's Application

For (Contract):								Application Number:			
Application Period:								Application Date:			
A					B	C	D	E	F		
Item		Contract Information				Estimated Quantity Installed	Value of Work Installed to Date	Materials Presently Stored (not in C)	Total Completed and Stored to Date (D + E)	% (F / B)	Balance to Finish (B - F)
Bid Item No.	Description	Item Quantity	Units	Unit Price	Total Value of Item ($)						
	Page Totals										

RFI #: Click here to enter text.

CITY BID NUMBER: 2004-21

DATE SUBMITTED: Click here to enter a date.

PROJECT TITLE: Sheboygan Senior Activity Center – Phase I Remodel

DATE RESPONSE REQUESTED: Click here to enter a date.

REQUESTED BY: Click here to enter text.

CONTRACTOR: Click here to enter text.

SPECIFICATION SECTION OR DRAWING NUMBER:

Click here to enter text.

DESCRIPTION OF REQUEST:

Click here to enter text.

DOCUMENTS ATTACHED: ☐ Yes ☐ No

DETAILED RESPONSE:

Click here to enter text.

DOCUMENTS ATTACHED: ☐ Yes ☐ No

PREPARED BY: Click here to enter text. DATE RESPONSE SENT: Click here to enter a date.

CITY OF SHEBOYGAN
PUBLIC WORKS

Contract Change Order

Change Order Number: _____

Project: _____ **Date of Issuance:** _____

Bid Number: _____ **Effective Date:** _____

Contractor: _____

Change in Contract Price Summary

Original Contract Price: _____

Increase/(Decrease) from Previously Accepted Change Orders: _____

Contract Price Prior to this Change Order: _____

Increase/(Decrease) of this Change Order: _____

Contract Price Incorporating this Change Order: _____

Change in Contract Times Summary

	Substantial Completion	Ready for Final Payment
Original Completion Date (or days):		
Increase/(Decrease) from Previously Accepted Change Orders:		
Completion Date (or days) Prior to this Change Order:		
Increase/(Decrease) of this Change Order:		
Completion Date (or days) Incorporating this Change Order:		

The Contract is modified as follows upon execution of this Change Order:

Add the Following Items of Work

Item #:	Description	Qty.	Unit	Unit Price	Extension

Total Additional Work:

Revise the Following Items of Work

		Original				Revised			
Item #:	Description	Quantity	Units	Unit Price	Extension	Quantity	Units	Unit Price	Extension
N/A									
		Original Total:				**Revised Total:**			

Total Revised Work *(Revised - Original)*:

	Contract
Total Additional Work:	
Total Revised Work:	
Net Change in Contract:	

Final quantities to be determined based on actual quantities constructed and measured.

CITY OF SHEBOYGAN
PUBLIC WORKS

Contract Change Order

Change Order Number: _____

Project: _____ **Date of Issuance:** _____

Bid Number: _____ **Effective Date:** _____

Contractor: _____

Revise the Project Manual and Specifications as Follo

Signatures

Recommended By: _____ Engineer/Project Manager — Date: _____

Accepted By: _____ Contractor (Authorized) — Date: _____

Accepted By: _____ City of Sheboygan — Date: _____

Project Name: Sheboygan Senior Activity Center – Phase I Remodel

Bid Number: 2004-21

Contractor: Click here to enter text.

This ☐Preliminary ☐Final Certificate of Substantial Completion applies to:

☐ All Work

☐ The following specified portions of the Work:

Date of Substantial Completion: Click here to enter a date.

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate, if appropriate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract.

The following documents are attached to and made a part of this Certificate: Click here to enter text.

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract.

EXECUTED BY CITY:		RECEIVED:	
By:	Engineer/Project Manager	By:	Contractor (Authorized Signature)
Title:		Title:	
Date:		Date:	

PROJECT NAME: **Sheboygan Senior Activity Center – Phase I Remodel, 1728 North 8th Street., Sheboygan WI 53801**

I CERTIFY to the best of my knowledge and belief that all work has been performed and materials supplied in strict accordance with the terms and conditions of the corresponding contract documents between the CITY OF SHEBOYGAN, hereinafter called the OWNER, and _____, hereinafter called the Contractor, for the above referenced project.

I further certify and declare that, except as listed below, all bills for materials, supplied, utilities, and for all other things furnished or caused to be furnished by the CONTRACTOR and used in the execution of the contract will be fully paid upon receipt of Final Payment and that there are no unpaid obligations, liens, claims, security interests, encumbrances, liabilities, and/or demands of State or Federal Agencies, subcontractors, materialmen, mechanics, laborers, or any others resulting from or arising out of any work done, caused to be done, or ordered to be done by the Contractor under the contract.

EXCEPTIONS: (If none, write "NONE," Contractor shall furnish a bond, acceptable to the Owner, for each exception)

In consideration of the prior and final payments made and all payments made for authorized changes, the Contractor releases and forever discharges the OWNER from any and all obligations, liens, claims, security interests, encumbrances, and/or liabilities arising by virtue of the contract and authorized changes between the parties, either verbal or in writing, and any and all claims and demands of every kind and character whatsoever against the OWNER, arising out of or in any way relating to the contract and authorized changes.

I further certify and agree that the warranty period is defined as commencing with Substantial Completion (or with each Substantial Completion if there is more than one) of the Project, or any portion thereof, and continuing for one (1) calendar year from the date of Final Acceptance of the entire project unless otherwise modified in writing as part of the Substantial Completion of Final Acceptance.

This statement is made for the purpose of inducing the Owner to make FINAL PAYMENT under the terms of the contract, relying on the trust and statements contained herein.

_____
Signed

_____
Title

Subscribed and sworn to before me
this _____ day of _____, 20____.

_____

_____

My commission expires _____ (Seal)

TO OWNER: City of Sheboygan
2026 New Jersey Avenue
Sheboygan, WI

PROJECT NAME: **Sheboygan Senior Activity Center – Phase I Remodel, 1728 North 8th Street., Sheboygan WI 53801**

DATE: _____

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the

Surety Name: _____

Address: _____

_____

_____, Surety,

on bond of,

Contractor Name: _____

Address: _____

_____

_____, Contractor,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to

City of Sheboygan
2026 New Jersey Avenue
Sheboygan, WI , Owner,

as set for in said Surety's bond.

_____
(Surety)

Attest:
(Seal): _____
(Signature of Authorized Representative)

_____
(Print Name and Title)

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By

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ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

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ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

NSPE®
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Endorsed By

CSI®
Building Knowledge
Improving Project Delivery

NUCA
We Dig America

EJCDC® C-700, Standard General Conditions of the Construction Contract.
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(202) 347-7474

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by

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Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or

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communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.

23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

    b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

    c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

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32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part

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thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

46. *Technical Data*

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

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50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

1. does not conform to the Contract Documents;

2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

3. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.

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4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. *Contract Price or Contract Times*: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.

G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

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2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

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2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

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3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take

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precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

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ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

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C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
2. Abnormal weather conditions;
3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and
4. Acts of war or terrorism.

D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.
2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.
3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

1. The circumstances that form the basis for the requested adjustment;
2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;
3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;
4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and
5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the

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effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise;

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(b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

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D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement

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to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

    c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

    a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;

    b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

    c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities.

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Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written

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statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

    c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

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2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

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F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

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ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the

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required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

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2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

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4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

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D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.

2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

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1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at

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Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

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7.05 *"Or Equals"*

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

    a. in the exercise of reasonable judgment Engineer determines that the proposed item:

        1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

        2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

        3) has a proven record of performance and availability of responsive service; and

        4) is not objectionable to Owner.

    b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:

        1) there will be no increase in cost to the Owner or increase in Contract Times; and

        2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

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E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:

   a. will certify that the proposed substitute item will:

      1) perform adequately the functions and achieve the results called for by the general design;

      2) be similar in substance to the item specified; and

      3) be suited to the same use as the item specified.

   b. will state:

      1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;

      2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

      3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

   c. will identify:

      1) all variations of the proposed substitute item from the item specified; and

      2) available engineering, sales, maintenance, repair, and replacement services.

   d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in

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Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or

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otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any

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license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to

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such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any

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of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

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7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determine and verify:

1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. *Samples*

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer

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may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two

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resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.

B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

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2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

1. Observations by Engineer;

2. Recommendation by Engineer or payment by Owner of any progress or final payment;

3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. Use or occupancy of the Work or any part thereof by Owner;

5. Any review and approval of a Shop Drawing or Sample submittal;

6. The issuance of a notice of acceptability by Engineer;

7. The end of the correction period established in Paragraph 15.08;

8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity

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directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

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G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be

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set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
2. An itemization of the specific matters to be covered by such authority and responsibility; and
3. The extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

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C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

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9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

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B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any

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Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

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3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving

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the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);

2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will be determined as follows:

1. A mutually acceptable fixed fee; or

2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;

b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;

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c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and

f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

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B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

    a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

    b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

    The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

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11.10 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal

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and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe

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benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.

5. Other costs consisting of the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

        1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

    c. *Construction Equipment Rental*

        1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment,

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machinery, or parts must cease when the use thereof is no longer necessary for the Work.

2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

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2. The cost of purchasing, renting, or furnishing small tools and hand tools.

3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

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13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

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b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

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5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved

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by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then

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Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

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3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work;

   b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

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c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

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e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. The Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. The Contract Price has been reduced by Change Orders;

i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or

l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

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C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.

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2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.

2. The final Application for Payment must be accompanied (except as previously delivered) by:

a. all documentation called for in the Contract Documents;

b. consent of the surety, if any, to final payment;

c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

d. a list of all duly pending Change Proposals and Claims; and

e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment

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bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

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15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;
2. correct such defective Work;
3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

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ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as

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to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

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ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be

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as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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GENERAL

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2018 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

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ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

Add the following as paragraph 1.01.A.49"

49. Designer – The individual or entity, if named as such in the agreement, and with which Owner has contracted for the design of the Work.

Add the following as paragraph 1.01.B:

B. Wherever the term City or CITY is used in these documents, it shall refer to the City of Sheboygan, Sheboygan County, Wisconsin, as represented by its elected officials. The terms "City" and "Owner" in this respect shall be considered synonymous

SC – 1.02 Terminology

Add the following as new paragraph 1.02.H:

H. Business Day:

1. The words "business day" mean every day the calendar shows, except Saturdays, Sundays, and City-Specified holidays, measured from midnight to the next midnight.

ARTICLE 2 – PRELIMINARY MATTERS

SC-2.02 Copies of Documents

Delete paragraph 2.02.A. in its entirety and insert the following:

A. Owner shall furnish to Contractor one copy of the fully executed Agreement. Owner will not furnish printed copies of the Project Manual or the Drawings. The electronic portable document format (PDF) Project Manual and Drawings furnished during bidding shall be used by Contractor.

Delete paragraph 2.02.B. in its entirety and insert the following:

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications. Owner shall make such original printed

record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

Delete paragraph 2.03.A.3 in its entirety and insert the following:

3. a preliminary Schedule of Values for lump sum items with Bid Unit Prices in excess of $100,000, and for which no payment method is defined in the specifications, which includes quantities and prices of items which when added together equal the Bid Unit Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF WORK

SC-4.01 Commencement of Contract Times; Notice to Proceed

Delete the last sentence of paragraph 4.01.A. in its entirety and replace with the following:

In no event will the Contract Times commence to run later than the 115th day after the day of Bid opening or the 30th day after the Effective Date of the Agreement, whichever date is earlier, unless otherwise specified the Section 01 11 00 – SUMMARY OF WORK.

SC-4.03 Reference Points

Delete paragraph 4.03.A and replace with the following:

A. Engineer shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work. Contractor shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Engineer. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by a Wisconsin licensed Professional Land Surveyor, in good standing, with qualifications approved by the Engineer, to do the re-staking.

SC-4.05 Delays in Contractor's Progress

Delete paragraph 4.05.C.2 and replace with the following:

C. Abnormal Weather Conditions – Conditions of extreme or unusual weather for a given region, elevation, or season as determined by Engineer. Extreme or unusual weather that is typical for a given region, elevation, or season should not be considered Abnormal Weather Conditions.

ARTICLE 5 – SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03 – Subsurface and Physical Conditions

Add the following new paragraphs immediately after Paragraph 5.03.A.3:

4. The reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely are identified in Specification 01 11 00 – Summary of Work.

5. The drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data, and specifically identifies the Technical Data upon which Contractor may rely are identified in Specification 01 11 00 – Summary of Work

6. Contractor may examine copies of reports and drawings identified in SC-5.03.A.4 and SC-5.03.A.5 that were not included with the Bidding Documents at City of Sheboygan Department of Public Works by requesting a meeting to occur during regular business hours, or may request copies from Engineer.

SC-5.06 – Hazardous Environmental Conditions

Add the following new paragraphs immediately after Paragraph 5.06.A.3:

4. The reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely are identified in Specification 01 11 00 – Summary of Work.

5. The drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely are identified in Specification 01 11 00 – Summary of Work.

6. Contractor may examine copies of reports and drawings identified in SC-5.06.A.1 and SC-5.06.A.5 that were not included with the Bidding Documents at City of Sheboygan Department of Public Works by requesting a meeting to occur during regular business hours, or may request copies from Engineer.

ARTICLE 6 – BONDS AND INSURANCE

SC-6.01 Bonds and Insurance

Add the following to the end of paragraph 6.01.E.

Owner will make no further progress payments under the Agreement until Contractor provides the required bond.

SC-6.03 Contractor's Insurance

Add the following new paragraph immediately after Paragraph 6.03.J:

D. *Other Additional Insureds*: As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as

additional insureds (in addition to Owner and Engineer) the following: Designer, if identified in the Agreement.

E. *Workers' Compensation and Employer's Liability*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Jones Act (if applicable)	
Bodily injury by accident—each accident	$1,000,000
Bodily injury by disease—aggregate	$1,000,000
Employer's Liability	
Each accident	Statutory
Each employee	Statutory
Policy limit	Statutory
Stop-gap Liability Coverage	
For work performed in monopolistic states, stop-gap liability coverage must be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of:	$

F. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,

2. damages insured by reasonably available personal injury liability coverage, and

3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

G. C*ommercial General Liability—Form and Content*: Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage.

    a. Such insurance must be maintained for three years after final payment.

b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Severability of interests and no insured-versus-insured or cross-liability exclusions.

4. Underground, explosion, and collapse coverage.

5. Personal injury coverage.

6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.

7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

H. *Commercial General Liability—Excluded Content*. The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).

2. Any exclusion for water intrusion or water damage.

3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.

4. Any exclusion of coverage relating to earth subsidence or movement.

5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).

6. Any limitation or exclusion based on the nature of Contractor's work.

7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

I. Commercial General Liability—Minimum Policy Limits

Commercial General Liability	Policy limits of not less than:
General Aggregate	$2,000,000
Products—Completed Operations Aggregate	$2,000,000
Personal and Advertising Injury	$2,000,000
Bodily Injury and Property Damage—Each Occurrence	$1,000,000

J. *Automobile Liability*: Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	Policy limits of not less than:
Bodily Injury	
Each Person	$1,000,000
Each Accident	$1,000,000
Property Damage	
Each Accident	$1,000,000
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	$1,000,000

K. *Umbrella or Excess Liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	$2,000,000
General Aggregate	$1,000,000

L. *Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements*: Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of $[specify amount] after accounting for partial attribution of its limits to underlying policies, as allowed above.

M. *Contractor's Pollution Liability Insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	N/A
General Aggregate	N/A

.

N. *Contractor's Professional Liability Insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	$1,000,000
Annual Aggregate	$1,000,000

.

O. *Railroad Protective Liability Insuranc*e: Prior to commencing any Work within 50 feet of railroad-owned and controlled property, Contractor shall (1) endorse its commercial general liability policy with ISO CG 24 17, removing the contractual liability exclusion for work within 50 feet of a railroad, (2) purchase and maintain railroad protective liability insurance meeting the following requirements, (3) furnish a copy of the endorsement to Owner, and (4) submit a copy of the railroad protective policy and other railroad-required documentation to the railroad, and notify Owner of such submittal.

Railroad Protective Liability Insurance	Policy limits of not less than:
Each Claim	As required by Railroad
Aggregate	As required by Railroad

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

SC-7.02 Supervision and Superintendence

Add the following paragraphs immediately after Paragraph 7.02.B

A. Contractor shall provide to Engineer and Owner the name and telephone number of the resident superintendent or another responsible person who will be available to contact during non-working hours, weekends and holidays.

SC-7.03 Labor; Working Hours

Add the following a new subparagraphs immediately after Paragraph 7.03.C:

1. Regular Working Hours shall be 7:00 am to 7:00 PM, local time, Monday through Friday.

2. Owner's Legal Holidays are as follows:

    a. New Year's Day
    Good Friday (Friday before Easter)
    Memorial Day
    Independence Day
    Labor Day
    Thanksgiving Day
    Day after Thanksgiving
    Christmas Eve Day
    Christmas Day
    New Year's Eve Day

    b. When a scheduled legal holiday falls on Saturday it will be observed on the previous Friday. A holiday that falls on Sunday will be observed the following Monday. The City retains the right to schedule holiday observance which bests suits its operations schedule.

SC-7-12 Record Documents

Delete the last sentence of paragraph 7.12.A and replace with the following:

Within 14 days following completion of the Work and prior to final payment, Contractor shall deliver these record documents to Engineer.

Add the following as Paragraph 7.15.B:

B. In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, and Contractor cannot be reached, Owner or Engineer may act to attempt to prevent threatened damage, injury, or loss. Owner or Engineer will give Contractor prompt written notice of such action and the cost of the correction or remedy shall be charged against Contractor. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Owner or Engineer in response to such an emergency, a Work Change Directive or Change Order will be issued.

ARTICLE 8 – OTHER WORK AT THE SITE

SC – 8.02 Coordination

Modify paragraph 8.02.A as follows:

Delete the words "the Supplementary Conditions" and replace with the words "Specification Section 01 11 00 – Summary of Work".

Modify paragraph 8.02 as follows:

Delete the words "the Supplementary Conditions" and replace with the words "Specification Section 01 11 00 – Summary of Work".

SC – 8.03 Legal Relationships

Modify the second sentence of paragraph 8.03.A as follows:

Delete the words "30 days" and replace with the words "10 days".

SC – 8.04 Claims Between Contractors

Add the following new section immediately following Section 8.03:

8.04 Claims Between Contractors

A. Should Contractor cause damage to the work or property of any separate contractor at the Site, or should any claim arising out of Contractor's performance of the Work at the Site be made by any separate contractor against Contractor, Owner, Engineer, Engineer's Consultants, or the construction coordination, Contractor shall promptly attempt to settle with such separate contractor by agreement or to otherwise resolve the dispute by arbitration or at law.

B. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner, Engineer, Engineer's Consultants, the construction coordinator and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages (including, but not limited to, fees and charges of engineers, architects, attorneys, and other professionals and court and arbitration costs) arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any separate contractor against Owner, Engineer, Engineer's Consultants, or the construction coordinator to the extent said claim is based on or arises out of Contractor's performance of the Work. Should a separate contractor cause damage to the Work or property of Contractor or should the performance of work by any separate contractor at the Site give rise to any other Claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer, Engineer's Consultants, or the construction coordinator or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from Owner, Engineer, Engineer's Consultants, or the construction coordinator on account of any such damage or Claim.

C. If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of a separate contractor, and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a Claim for an extension of times in accordance with Article 11. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, Engineer, Engineer's Consultants, and construction coordinator for any delay, disruption, interference, or hindrance caused by any separate contractor. This paragraph does not prevent recovery from Owner, Engineer, Engineer's Consultant, or construction coordinator for activities that are their respective responsibilities.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

SC – 10.08 Compliance with Safety Program

Add the following as paragraph 10.08

B. In the event Engineer determines that Contractor's safety plans, programs, and procedures do not provide adequate protection for Engineer, Engineer may direct its employees to leave the Site or implement additional safeguards for Engineer's protection. If taken, these actions will be in furtherance of Engineer's responsibility to its own employees only, and Engineer will not assume any responsibility for protection of any other persons affected by the Work. In the event Engineer observes situations which appear to have potential for immediate and serious injury to persons, Engineer may warn the persons who appear to be affected by such situations. Such warnings, if issued, shall be given based on general humanitarian concerns, and Engineer will not, by the issuance of any such warning, assume any responsibility to issue future warnings or any general responsibility for protection of persons affected by the Work.

ARTICLE 11 –CHANGES TO THE CONTRACT

SC – 11.06 Change Proposals

Modify the first sentence of paragraph 11.06.B.1 as follows:

Delete the words "30 days" and replace with the words "10 days".

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

SC – 13.03 Unit Price Work

Modify the paragraph 13.03.B and replace with the following:

The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparisons of Bids and determining initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities, unless noted otherwise in the specifications.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC – 15.01 Progress Payments

Add the following as paragraph 15.01.B.4

1. The Application for Payment form to be used is EJCDC C-620 or City of Sheboygan Application for Payment Form 00 62 76, or a similar form approved by the Owner

SC - 15.01 Progress Payments

Modify the first sentence of paragraph 15.01.B.1 as follows:

Delete the words "20 Days" and replace with the words "thirty days".

Modify the second sentence of paragraph 15.01.D.1 as follows:

Delete the words "Ten days" and replace with the words "Forty-five days".

SC – 15.06 Final Payment

Add the following as Paragraph 15.06.A.2.f

f. Contractors Affidavit of Compliance (Document 00 65 18)

LIQUIDATED DAMAGES		
Original Contract Amount		
From more than:	To and including:	Calendar Day
$0	$100,000	$180
$100,000	$300,000	$295
$300,000	$500,000	$480
$500,000	$1,000,000	$665
$1,000,000	--------	$990

ARTICLE 19 – LIQUIDATED DAMAGES

SC-19.01 Liquidated Damages Schedule

Add the following as Article 19 – LIQUIDATED DAMAGES

19.01 The following table represents the Liquidated Damages applicable to City of Sheboygan Agreements as referenced in paragraph 4.03 of the Agreement:

LIQUIDATED DAMAGES		
Original Contract Amount		
From more than:	To and including:	Calendar Day
$0	$100,000	$180
$100,000	$300,000	$295
$300,000	$500,000	$480
$500,000	$1,000,000	$665
$1,000,000	--------	$990

PART 1 – GENERAL

1.01 SUMMARY

A. Summary of the Work including work by the City, City-Furnished Products, Work by Others, Sequence of work, Contractors use of the Premises.

B. Work under the project will generally consist of the items stated in 00 11 13 – Advertisement for Bids.

1.02 PAYMENT PROCEDURES

A. Work specified in the Sections is considered incidental and payment shall be included as part of appropriate unit prices included on Bid Form.

1.03 WORK BY THE CITY

A. City of Sheboygan will complete parking lot improvements.

1.04 PERMITS

A. The following permits have been obtained or will be obtained by the City of Sheboygan prior to the start of Construction:
   a. None.

1.05 SUBSURFACE AND PHYSICAL CONDITIONS

A. The reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely are:

   a. None.

B. The drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data, and specifically identifies the Technical Data upon which Contractor may rely are:

   a. None.

1.06 HAZARDOUS ENVIRONMENTAL CONDITIONS

A. The reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely are

   a. None.

B. The drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely are

a. None.

PART 2 – PRODUCTS

2.01 CITY FURNISHED PRODUCTS

A. None.

PART 3 – EXECUTION

(NOT USED)

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

A. Provide all items, articles, materials, operations or method, labor, supervision, equipment, incidentals, taxes and permits necessary to complete the Work as described within the Contract Documents. Install all items furnished by City as mentioned or scheduled within the Contract Documents.

1.02 PAYMENT PROCEDURES

A. Work specified in the Section is considered incidental and payment shall be included as part of appropriate unit prices included on Bid Form.

1.03 SEQUENCE OF WORK

A. Determining the sequence of tasks is the responsibility of the General contractor. Sequencing of tasks shall be determined in such a way as to not damage completed work.

1.04 CONTRACTOR USE OF THE PREMISES

A. Use of site: Limit use of premises to work in areas indicated. Do not disturb portions of site beyond areas in which the work is indicated.

1. Limits: Confine construction operations to areas indicated on Construction Drawings as within the limits of construction.

2. Existing Building: Maintain existing building in a weathertight condition throughout construction period.

1.05 REFERENCE STANDARDS OR SPECIFICATIONS

A. When other specifications documents are referenced within this project manual any text within those documents discussing contract administration, measurement or payment are not included, unless otherwise specified.

B. Where compliance with two or more industry standards or sets of requirements are specified, and the overlapping of those standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent requirement (which is generally recognized to be also most costly) is intended and will be enforced, unless more detailed language written directly into Contract Documents clearly indicates that a less stringent requirement is acceptable.

1.06 NOTIFICATION TO THE PUBLIC

A. Notify affected residents and businesses a minimum of 7 business days prior to commencing work.

B. Notify affected residents and businesses a minimum of 3 business days prior to closing a driveway.

C. Notify Engineer 7 business days prior to closing a street. Engineer will notify Sheboygan Police, Fire and Ambulance, Sheboygan County Sheriff's Department and Sheboygan Transit.

1.07 ACCESS REQUIRMENTS

A. Maintain access to business and residents at all times, unless otherwise noted.

B. Provide continuous access for emergency vehicles.

C. Comply with Section 01 11 00 – Summary of work for additional access requirements, if any.

1.08 MAIL DELIVERY

A. Work with the U.S. Postal Service to assure mail delivery throughout the project. Some or all mail boxes may have to be moved, temporarily relocated or replaced in a new location. Relocating mail boxes, temporarily or permanently, shall be incidental to the contract, and meet the Postal Service criteria.

1.09 REMOVALS

A. Do not remove or damage any tree, shrub, or other land resource unless indicated for removal.

B. At limits of pavement, curb and gutter, driveway or sidewalk removal provide a full depth saw cut prior to removal. Provide straight, vertical sawcuts at all edges of existing asphalt and concrete materials to be matched by new pavement materials. This shall include curb and gutter, driveway aprons, sidewalk, and street pavement and patching work. If the sawed edges break prior to placement of the new pavement, curb and gutter, driveway or sidewalk, re-sawcut the existing edge.

1.10 PROJECT MEETINGS

A. Conduct bi-weekly progress meetings throughout the construction period. Meetings will be held at the Sheboygan Department of Public Works office.
   1. Items to be discussed at meeting shall include, but not be limited to:
      a. Review of progress since previous meeting.
      b. Review Outstanding Items since last meeting.
      c. Contractors Schedule (3-week look ahead).
      d. Submittal Schedule.

1.11 CONSTRUCTION STAKING

A. Layout of the work is the responsibility of the Contractor.

1.12 SUBMITTALS

A. Work–Related Submittals:

   1. Shop Drawings:
      a. As defined in Paragraph 1.01.A.39 of the General Conditions, and in particular includes technical data and drawings specifically prepared for this Project, including fabrication and installation drawings, diagrams, data sheets, schedules, templates,

patterns, reports, instructions, design mix formulas, measurements, and similar information not in standard printed form.

2. Product Data:
   a. Includes standard catalog type printed information on manufactured materials, equipment and systems that has not been specifically prepared for this Project, including manufactures' product specifications, manufacturers' instructions, catalog cut sheets, standard wiring diagrams, printed performance curves, mill reports, and standard color charts.
3. Test Results:
   a. Includes source and field quality inspection and test reports, actual performance curves, and certifications of results prepared specifically for equipment, material, and systems provided for this Project.
4. Miscellaneous Submittals:
   a. Work-related submittals that do not fit in previous categories, including schedules, guarantees, warranties, certifications, maintenance agreements, workmanship bonds, survey data and reports, physical work records, copies of industry standards, field measurements, extra materials, keys, and similar information, devices, and materials applicable to Work.

B. Action On Submittals

1. Unsolicited Submittals:
   a. Engineer will return unsolicited submittals without reviewing.
2. `Response:
   a. Marked: "Approved"
      1. Work covered by submittal may proceed provided it complies with Contract Documents. Acceptance of Work depends on that compliance.
   b. Marked: "Approved As Noted"
      1. Work covered by submittal may proceed provided it complies with Engineer's notations or corrections on submittal and with Contract Documents. Acceptance of work depends on that compliance. Resubmittal not required.
   c. Marked: "Not Approved"
      1. Work covered by submittal does not comply with Contract Documents. Do not proceed with Work covered by submittal.
      2. Prepare new submittal complying with Contract Documents and Engineer's notations.
   d. Marked: "Filed for Record"
      1. Work covered by the submittal does not require approval.
      2. Submitted documentation is filed with the project records.

1.13 MANUFACTURERS' DIRECTIONS

A. Manufactured articles, materials and equipment shall be stored, commissioned, operated, applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer, unless specified to the contrary.

B. Wherever specifications explicitly call for work to be performed or materials to be installed in accordance with the manufacturer's directions, furnish copies in accordance with the Submittals paragraphs of the specification section before installing the material or performing the work.

1.14 PROJECT OBSERVATION

A. All work under this proposal shall be subject to the observation by authorized personnel of the Engineer, and all findings, determinations and recommendations by the Engineer or its duly authorized agents shall be final and conclusive.

B. Provide the Engineer a three business day notice prior to the start of any work on the project. Any work done without three business day notice will be subject to non-payment. If observation of the work is not required, the Engineer shall inform the foreman and the work will be reviewed upon completion.

1.15 INCIDENTAL ITEMS OF WORK

A. Any items of work shown on the drawings or required by the specifications but not specifically included in the Bid shall be considered incidental items of work. The cost of incidental items of work shall be included in the prices bid for related work.

1.16 PERMITS

A. Acquire all necessary City permits. Contact the Building Inspection Department at 920-459-3477 to determine the associated fees and shall be incidental to the contract. These permits shall be obtained at the City of Sheboygan Building Inspection Department located on the 1st Floor of City Hall, 828 Center Avenue, Sheboygan, Wisconsin.

B. Comply with the City licensing requirements established by the City of Sheboygan Building Inspection Department for plumbing, HVAC, electrical and building construction. These applications are obtained in the Building Inspection Department, located on the 1st Floor of City Hall, 828 Center Avenue, Sheboygan, Wisconsin.

C. Comply with permits, if any, identified is Section 01 11 00 – Summary of Work.

1.17 EXISTING FACILITIES

A. Provide a minimum of a 3 business day notice to owners of existing utilities prior to excavation activities.

B. The requirements of Section 182.0175 of the Wisconsin State Statutes apply to work under this contract.

1.18 DELIVERY, STORAGE, AND HANDLING

A. Adjust weight, type, capacity, haul routes, and method of operation of hauling vehicles such that there is no damage to existing streets, subgrade, or base course.

B. Engineer has final authority to revise haul routes, procedures, and operation times.

C. Keep haul routes clean and free of construction material and debris.

D. Construction equipment, materials and stockpiles shall not be left within 100 feet of any commercial establishment during non-working hours or when no working is occurring.

E. Parking restrictions shall be obeyed at all times in the vicinity of schools.

1.19 WATER UTILITY AND HYDRANT USE

A. Do not operate any hydrants, valves or other apparatus owned by the Sheboygan Water Utility.

B. Should water from hydrants be needed during construction, the contractor shall apply, in person, for a hydrant use permit at the Sheboygan Water Utility Office, 72 Park Avenue. Any damage to Water Utility apparatus shall be repaired at the Contractor's expense.

C. Coordinate with Sheboygan Water Utility to repair any damaged water service laterals or water mains. Sheboygan Water Utility will determine extent of repairs required. If a lead water service is exposed contract the Sheboygan Water Utility within 1 hour.

1.20 SANITARY FACILITIES

A. Provide and maintain sanitary chemical toilets located where approved and in sufficient number required for the work force employed by Contractor.

1.21 PUBLIC RECORDS LAW

A. The City of Sheboygan is subject to the Wisconsin public records law. Any submissions to the City in connection with this project may be disclosed in response to a public records request.

PART 2 – PRODUCTS

2.01 CITY FURNISHED PRODUCTS

A. City will furnish materials as specified in Section 01 64 00 – City Furnished Products of the Project Specific Manual. If section is not included in the Project Specific Manual, then no products will be furnished by City.

PART 3 – EXECUTION

(NOT USED)

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:
1. Quality assurance.
2. Procedures to measure and report the quality and performance of the Work.
3. Requirements for Contractor Cooperation
4. Payment.

1.02 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment:
1. All Work and costs of this Section shall be incidental to the Project and included in the Total Base Bid.

1.03 SUBMITTALS

A. Prior to start of Work, submit testing laboratory name for various specified tests for approval by Engineer.

B. After each inspection or test, submit copies of report to Engineer no later than 3 business days after completion of inspection or test. Include:
1. Test date
2. Project Number and Title
3. Inspector or Tester
4. Date and time of sampling, testing or inspection
5. Location of inspection or test
6. Identification of product and applicable Specification Section.
7. Test Results
8. Conformance with Contract Documents.

C. Manufacturer's certificates of quality control or performance.

1.04 WORKMANSHIP

A. Comply with industry standards of the region, except where more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

1.05 TESTS AND INSPECTIONS

A. Conform to the requirements of the General Conditions, except as modified herein.

B. Notify Engineer 48 hours prior to expected time for operations requiring tests and inspections.

C. Provide incidental labor and facilities to obtain and handle samples at Site or source, transport samples to laboratory, and facilitate tests and inspections for storing and curing of test samples.

D. Owner shall pay for all testing not identified in the specifications. Any test identified in the specifications is the responsibility of the contractor.

1. If any test fails to meet requirements, reimburse Owner for cost of all subsequent tests to ensure compliance.

E. Notify Engineer of pit and scale location and other correlated items prior to beginning Work.

1.06 LABORATORY RESPONSIBILITIES

A. Test samples and perform field tests.

B. Provide qualified personnel. Cooperate with Engineer and Contractor in performance of services.

C. Ascertain compliance with the requirements of the Contract Documents.

D. When requested by Engineer, provide interpretation of test results.

1.07 LIMITS ON TESTING LABORATORY AUTHORITY

A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Laboratory may not approve or accept any portion of the Work.

C. Laboratory may not assume any duties of Contractor.

D. Laboratory has no authority to stop Work.

1.08 MANUFACTURER'S CERTIFICATES

A. If requested by Engineer, submit manufacturer's certificate with shop drawings certifying that products meet or exceed specified requirements executed by responsible officer.

1.09 MANUFACTURER'S FIELD SERVICES

A. Provide qualified representative to observe field conditions; conditions of surfaces and installation; quality of workmanship; start-up of equipment; and test, adjust, and balance of equipment.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

(NOT USED)

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

A. Maintain work areas free from environmental pollution that would be in violation of federal, state or local regulations.

B. Permits obtained by Owner are list in Section 01 11 00 – Summary of Work. All other permits not listed are to be obtained by Contractor.

1.02 PAYMENT PROCEDURES

A. Work specified in this section is considered incidental and payment shall be included as part of appropriate unit prices included in Bid Form.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

3.01 GENERAL

A. Confine construction activities to areas defined on the Drawings or elsewhere in the Contract Documents.

B. Grade site to drain. Maintain excavations free of water.

C. Protect site from puddling or running water.

1.03 ARCHAEOLOGICAL FINDS DURING CONSTRUCTION

A. There are no known archaeological remains at the Project site.

B. Should skeletons, artifacts, or other archaeological remains be uncovered:

2. Suspend operations of this Contract at the site of discovery.
3. Continue operations in other areas.
4. Notify Engineer immediately of the finding.

C. Should the discovery site require archaeological studies resulting in delays and/or additional work, Contractor will be compensated by an adjustment under pertinent provisions of the Contract.

4.03 PROTECTION OF STORM SEWERS

A. Prevent construction materials, concrete, earth or other debris from entering existing storm sewers or sewer construction.
B. Inlet protection required for all storm sewers with project limits.

4.04 PROTECTION OF WATERWAYS

A. Comply with federal, state and local regulations regarding pollution of lakes, streams, rivers or wetlands by dumping of refuse, rubbish, dredge material or debris.

B. Disposal of materials into waters of state must conform to requirements of Wisconsin DNR.

C. Comply with Wisconsin Department of Transportation "Product Acceptability List" (PAL), current edition and Wisconsin Department of Natural Resources Storm Water Management Technical Standards.

END OF SECTION

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes requirements for Project Closeout and Final Payment including:
   1. Submittals,
   2. Inspections Procedures,
   3. Record Document Submittals.

1.02 PAYMENT PROCEDURES

A. Work specified in this section is considered incidental and payment shall be included as part of appropriate unit prices included in Bid Form.

1.03 SUBSTANTIAL COMPLETION

A. Comply with section 15.03 of the General Conditions.

1.04 FINAL COMPLETION

A. Comply with Section 15.05 and 15.06 of the General Conditions

1.05 RECORD DRAWINGS

A. Submit to Engineer a set of record documents as described in paragraph 7.11.A of the General Conditions and Section 01 78 39 – Project Record Documents.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

3.01 PROJECT CLOSEOUT CHECKLIST

A. The project closeout checklist at the end of this document will be used by the Engineer to document the closeout status of the project.

END OF SECTION

PROJECT CLOSEOUT CHECKLIST (Based on 2018 EJCDC General Conditions of the Contract)

Contract Status	Item to be Competed:	Reference	Completed/Submitted By:	Date Completed:
Substantial Completion				
	Letter requesting Substantial Completion	GC 15.03.A	Contractor	
	Draft of Punch List Items to be completed or corrected before final payment	GC 15.03.A	Contractor	
	Inspect work	GC 15.03.B	Owner/Contractor/Engineer	
	Notification if not ready for Substantial Completion	GC 15.03.B	Engineer/Owner	
	Certification of Substantial Completion Issued	GC 15.03.C	Engineer/Owner	
			Date of Substantial Completion	

Final Completion				
	Letter requesting Final Completion	GC 15.05.A	Contractor	
	Inspect work	GC 15.05.A	Owner/Contractor/Engineer	
			Date of Final Completion	

Final Payment				
	Submit Record Drawings	GC 15.06.A.1 GC 15.06.A.2.a GC 7.12 SC 7.12 01 78 39	Contractor	
	Consent of Surety to Final Payment	GC 15.06.A.2.b	Contractor	
	List of Pending Change Proposals and Claims	GC 15.06.A.2.d	Contractor	
	Lien Waivers	GC 15.06.A.2.e	Contractor	
	Contractor's Affidavit of Compliance	SC 15.06.A.2.f	Contractor	
	Final Pay Application	GC 15.06.A.1	Contractor	
	Notice of Acceptability	GC 15.06.C	Engineer	
	Final Payment	GC 15.06.E	Owner	
			Date of Final Payment	

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property , for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

1.7 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

F. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches (300 mm) or more.

G. Storage or sale of removed items or materials on-site is not permitted.

H. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings.

1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Section 01 10 00 "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly. Comply with requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including topping slabs, formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Concrete Subcontractor.
    e. Special concrete finish Subcontractor.

2. Review construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, vapor-retarder installation, steel reinforcement installation, concrete repair procedures, and concrete protection.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer testing agency.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates.

D. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.
2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

    a. High-density overlay, Class 1 or better.
    b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    c. Structural 1, B-B or better; mill oiled and edge sealed.
    d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

D. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

E. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M.
2. Fly Ash: ASTM C 618.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595/C 595M, cement.
5. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: Insert dimension nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C 330/C 330M, nominal maximum aggregate size.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

G. Water: ASTM C 94/C 94M and potable.

2.5 FIBER REINFORCEMENT

A. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Euclid Chemical Company (The); an RPM company.
b. FiberForce by ABC Polymer Industries, LLC.
c. GCP Applied Technologies Inc.
d. Propex Operating Company, LLC.
e. Forta Corporation.

2.6 WATERSTOPS

A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Insert manufacturer's name.

2. Profile: Flat dumbbell with center bulb Ribbed with center bulb.
3. Dimensions: 6 inches by 3/8 inch thick; nontapered.

B. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Flat dumbbell with center bulb Ribbed with center bulb.
2. Dimensions: 6 inches by 3/8 inch thick; nontapered.

C. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Carlisle Coatings & Waterproofing Inc.
    b. CETCO, a Minerals Technologies company.
    c. Concrete Sealants Inc.
    d. Henry Company.
    e. JP Specialties, Inc.

D. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Adeka Corporation.
    b. CETCO, a Minerals Technologies company.
    c. GCP Applied Technologies Inc.
    d. Kryton International Inc.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Barrier-Bac; Inteplast Group, Ltd.
    b. Fortifiber Building Systems Group.
    c. ISI Building Products.
    d. Poly-America, L.P.
    e. Raven Industries, Inc.
    f. Reef Industries, Inc.
    g. Stego Industries, LLC.
    h. Tex-Trude, LP.

2.8 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Corp. - Construction Chemicals.
    b. ChemMasters, Inc.
    c. ChemTec International.
    d. Concrete Sealers USA.
    e. Curecrete Distribution Inc.
    f. Dayton Superior.
    g. Euclid Chemical Company (The); an RPM company.
    h. Kaufman Products, Inc.
    i. Laticrete International, Inc.
    j. NewLook International, Inc.
    k. Nox-Crete Products Group.
    l. PROSOCO, Inc.
    m. SpecChem, LLC.
    n. US SPEC, Division of US MIX Company.
    o. Vexcon Chemicals Inc.
    p. V-Seal Concrete Sealers & Specialty Coatings.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Corp. - Construction Chemicals.
b. Bon Tool Co.
c. Brickform; a division of Solomon Colors.
d. ChemMasters, Inc.
e. Dayton Superior.
f. Euclid Chemical Company (The); an RPM company.
g. Kaufman Products, Inc.
h. Lambert Corporation.
i. Laticrete International, Inc.
j. Metalcrete Industries.
k. Nox-Crete Products Group.
l. Sika Corporation.
m. SpecChem, LLC.
n. TK Products.
o. Vexcon Chemicals Inc.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Anti-Hydro International, Inc.
b. ChemMasters, Inc.
c. Dayton Superior.
d. Euclid Chemical Company (The); an RPM company.
e. Kaufman Products, Inc.
f. Lambert Corporation.
g. Laticrete International, Inc.
h. Nox-Crete Products Group.
i. SpecChem, LLC.
j. TK Products.
k. Vexcon Chemicals Inc.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Slag Cement: 50 percent.
4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
5. Silica Fume: 10 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
7. Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use admixture in concrete, as required, for placement and workability.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: See Structural Drawings for specific concrete mix design requirements.

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1-part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1-part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 MISCELLANEOUS CONCRETE ITEM INSTALLATION

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases Insert dimension high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

3.13 LIQUID FLOOR TREATMENT APPLICATION

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than 28 days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least two months. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three-consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 30 00

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Clay Faced Brick.
3. Mortar and grout.
4. Steel reinforcing bars.
5. Masonry-joint reinforcement.
6. Ties and anchors.
7. Miscellaneous masonry accessories.

B. Products Installed but not Furnished under This Section:

1. Cast-stone trim in unit masonry.
2. Steel lintels in unit masonry.
3. Steel shelf angles for supporting unit masonry.
4. Cavity wall insulation.

C. Related Requirements:

1. Section 05 12 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
3. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Clay face Hollow brick, in the form of straps of five or more bricks.
2. Colored mortar.
3. Weep holes/cavity vents.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
c. For exposed brick, include test report for efflorescence according to ASTM C67.
d. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing according to ASTM C67 or a list of addresses of buildings in Project's area where proposed brick has been used successfully and with a history of durability.
e. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Integral water repellent used in CMUs.
3. Cementitious materials. Include name of manufacturer, brand name, and type.
4. Mortar admixtures.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Grout mixes. Include description of type and proportions of ingredients.
7. Reinforcing bars.
8. Joint reinforcement.
9. Anchors, ties, and metal accessories.

B. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
    a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C1314.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.4 CONCRETE MASONRY UNITS

A. CMUs: ASTM C90.

1. Density Classification: Normal weight.

2.5 CONCRETE MASONRY LINTELS

A. General: Provide one of the following:

B. Concrete Lintels: ASTM C1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.

C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 03 20 00 "Concrete Reinforcing," and with reinforcing bars indicated.

D. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

B. Clay Face Brick: Facing brick complying with ASTM C 216 or hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).

2.7 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91/C91M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cemex S.A.B. de C.V.
b. Essroc.
c. Holcim (US) Inc.
d. Lafarge North America Inc.
e. Lehigh Hanson; HeidelbergCement Group.

E. Mortar Cement: ASTM C1329/C1329M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Lafarge North America Inc.

F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Corp. - Construction Chemicals.
b. Euclid Chemical Company (The); an RPM company.
c. GCP Applied Technologies Inc.

G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ACM Chemistries.
b. BASF Corp. - Construction Chemicals.
c. Euclid Chemical Company (The); an RPM company.
d. GCP Applied Technologies Inc.

H. Water: Potable.

2.8 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Dur-O-Wal; a Hohmann & Barnard company.
b. Heckmann Building Products, Inc.
c. Hohmann & Barnard, Inc.
d. Lock Rite.
e. Wire-Bond.

C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.

1. Interior Walls: Mill- galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inch diameter.
4. Wire Size for Cross Rods: 0.148-inch diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Wire-Bond.

E. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Wire-Bond.

2. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
3. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch cover on outside face.
4. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.9 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
2. Galvanized-Steel Sheet: ASTM A653/A653M, Commercial Steel, G60 zinc coating.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
3. Wire: Fabricate from hot-dip galvanized steel wire.

D. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
2. Tie Section: Triangular-shaped wire tie made from hot-dip galvanized steel wire.

E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Tie Section: Triangular-shaped wire tie made from hot-dip galvanized steel wire.

F. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

G. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
2. Fabricate sheet metal anchor sections and other sheet metal parts from hot-dip galvanized steel sheets.
3. Fabricate wire ties from hot-dip galvanized-steel wire.
4. Contractor's Option: Unless otherwise indicated, provide adjustable masonry-veneer anchors that meet wind load requirements per Structural Drawings.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

B. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.11 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime masonry cement or mortar cement mortar unless otherwise indicated.
3. For exterior masonry, use portland cement-lime masonry cement or mortar cement mortar.
4. For reinforced masonry, use portland cement-lime masonry cement or mortar cement mortar.
5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type M Type S.
3. For mortar parge coats, use Type S or Type N.
4. For exterior, above-grade, load bearing and non-load bearing walls and parapet walls; for interior load-bearing walls; for interior non-load bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior non-load bearing partitions, Type O may be used instead of Type N.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
3. Wedge non-load bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

A. Lay CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

B. Lay solid masonry units and hollow brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Set trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.
4. Rake out mortar joints for pointing with sealant.

D. Rake out mortar joints at to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.

F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

G. Cut joints flush where indicated to receive waterproofing cavity wall insulation air barriers unless otherwise indicated.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 24 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 24 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.

a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.

b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) ties to allow for differential movement regardless of whether bed joints align.

2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties.
c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

3. Header Bonding: Provide masonry unit headers extending not less than 3 inches into each wythe. Space headers not more than 8 inches clear horizontally and 16 inches clear vertically.
4. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Bond wythes of cavity walls together using bonding system indicated on Drawings.

C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

D. Parge cavity face of backup wythe in a single coat approximately 3/8 inch thick. Trowel face of parge coat smooth.

E. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 07 92 00 "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07 92 00 "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
3. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe.
4. At masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing at least 8 inches; with upper edge tucked under water-resistive barrier air barrier, lapping at least 4 inches. Fasten upper edge of flexible flashing to sheathing through termination bar.
5. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
6. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.

7. Install metal drip edges and sealant stops with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 07 92 00 "Joint Sealants" for application indicated.
8. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
9. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
10. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

E. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
3. Space weep holes 24 inches o.c. unless otherwise indicated.
4. Space weep holes formed from 16 inches o.c.
5. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
6. Trim wicking material flush with outside face of wall after mortar has set.

F. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 2 inches, to maintain drainage.

1. Fill cavities full height by placing pea gravel in cavities as masonry is laid, so that at any point, masonry does not extend more than 24 inches above top of pea gravel.

G. Place cavity drainage material in cavities airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

H. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.12 REINFORCED UNIT MASONRY

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches, see Structural Drawings.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Contractor will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C780. Test mortar for mortar air content and compressive strength.

I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

J. Prism Test: For each type of construction provided, according to ASTM C1314 at 28 days.

3.14 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.15 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

7. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.16 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 20 00 "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 20 00

SECTION 04 72 00 - CAST STONE MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Trim units.
2. Mortar materials.
3. Accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Verification:

1. For each color and texture of cast stone required, 4 inches square in size.
2. For each trim shape required, 4 inches in length.
3. For colored mortar, make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.

1.4 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C1364.

1. Provide test reports based on testing within previous six months.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by CSI.

B. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated. Retain one of two paragraphs below if mockups are required. First paragraph is for supplying trim units for installation within a masonry wall. Second is for larger or standalone installations.

C. Furnish cast stone for installation in mockups specified in Section 04 20 00 "Unit Masonry."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.

B. Pack, handle, and ship cast stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units if required, using dollies with wood supports.
2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.7 PROJECT CONDITIONS

A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.

B. Hot-Weather Requirements: Comply with hot-weather construction requirements in TMS 602.

PART 2 - PRODUCTS

2.1 CAST STONE MATERIALS

A. General: Comply with ASTM C1364.

B. Portland Cement: ASTM C150/C150M, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C114. Provide natural color or white cement as required to produce cast stone color indicated.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C33/C33M; gradation and colors as needed to produce required cast stone textures and colors.

D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C33/C33M, gradation and colors as needed to produce required cast stone textures and colors.

E. Color Pigment: ASTM C979/C979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

F. Admixtures: Use only admixtures specified or approved in writing by Architect.

1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.

G. Reinforcement:

1. Deformed steel bars complying with ASTM A615/A615M, Grade 40. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast stone material.

a. Epoxy Coating: ASTM A775/A775M.
b. Galvanized Coating: ASTM A767/A767M.

2.2 CAST STONE UNITS

A. Cast Stone Units: Comply with ASTM C1364.

1. Units shall be manufactured using the vibrant dry tamp method.

2. Trim units: window sills.

B. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
3. Provide drips on projecting elements unless otherwise indicated.

C. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

D. Cure Units as Follows:

1. Cure units in enclosed, moist curing room at 95 percent relative humidity and temperature of 100 deg F for 12 hours or 70 deg F for 16 hours.
2. Keep units damp and continue curing to comply with one of the following:

a. No fewer than five days at mean daily temperature of 70 deg F or above.
b. No fewer than seven days at mean daily temperature of 50 deg F or above.

E. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

F. Colors and Textures: Match Architect's samples.

2.3 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 04 20 00 "Unit Masonry."

B. Water: Potable.

2.4 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666.

B. Dowels: 1/2-inch- diameter round bars, fabricated from Type 304 stainless steel complying with ASTM A240/A240M, ASTM A276/A276M, or ASTM A666.

C. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cast stone manufacturer and expressly approved by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.5 MORTAR MIXES

A. Comply with requirements in Section 04 20 00 "Unit Masonry" for mortar mixes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

A. Set cast stone as indicated in TMS 604.

B. Install cast stone units to comply with requirements in Section 04 20 00 "Unit Masonry."

C. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
2. Coordinate installation of cast stone with installation of flashing specified in other Sections.

D. Wet joint surfaces thoroughly before applying mortar or setting in mortar.

E. Set units in full bed of mortar with full head joints unless otherwise indicated.

1. Set units with joints 1/4 to 3/8 inch wide unless otherwise indicated.
2. Build anchors and ties into mortar joints as units are set.
3. Fill dowel holes and anchor slots with mortar.
4. Fill collar joints solid as units are set.
5. Build concealed flashing into mortar joints as units are set.
6. Keep head joints in copings and between other units with exposed horizontal surfaces open to receive sealant.

7. Keep joints at shelf angles open to receive sealant.

F. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

G. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.

H. Tool exposed joints slightly concave when thumbprint hard. Use a smooth plastic jointer larger than joint thickness.

I. Rake out joints for pointing with sealant to depths of not less than 3/4 inch. Scrub faces of units to remove excess mortar as joints are raked.

J. Point joints with sealant to comply with applicable requirements in Section 07 92 00 "Joint Sealants."

1. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

K. Provide sealant joints at head joints of copings and other horizontal surfaces; at expansion, control, and pressure-relieving joints; and at locations indicated.

1. Keep joints free of mortar and other rigid materials.
2. Build in compressible foam-plastic joint fillers where indicated.
3. Form joint of width indicated, but not less than 3/8 inch .
4. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 92 00 "Joint Sealants."

3.3 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

A. Set cast stone as indicated in TMS 604.

B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated, with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.

C. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.

D. Fill anchor holes with sealant.

1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.

E. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.

F. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.

1. Form open joint of width indicated, but not less than 3/8 inch.

G. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.

H. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 92 00 "Joint Sealants."

3.4 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2 inch maximum.

B. Variation from Level: Do not exceed 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2 inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

3.5 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears, and spatter.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean cast stone by methods described in Cast Stone Institute Technical Bulletin #39.
6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION 04 72 00

SECTION 05 21 00 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. KCS-type K-series steel joists.
3. K-series steel joist substitutes.
4. LH- and DLH-series long-span steel joists.
5. Joist girders.
6. Joist accessories.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for installing bearing plates in concrete.
2. Section 04 20 00 "Unit Masonry" for installing bearing plates in unit masonry.
3. Section 05 12 00 "Structural Steel Framing" for field-welded shear connectors.

1.3 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.7 SEQUENCING

A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Canam Steel Corporation; Canam Group, Inc.
2. CMC Joist & Deck.
3. Gooder-Henrichsen Co.
4. New Millennium Building Systems, LLC.
5. Structures of U.S.A., Inc.
6. Valley Joist.
7. Vulcraft; Nucor Vulcraft Group.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

1. Use ASD; data are given at service-load level.
2. Design special joists to withstand design loads with live-load deflections no greater than the following:

a. Floor Joists: Vertical deflection of 1/480 of the span.
b. Roof Joists: Vertical deflection of 1/240 of the span.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.3 K-SERIES STEEL JOISTS

A. Manufacture steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists KCS-type K-series steel joists.

B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.

C. Provide holes in chord members for connecting and securing other construction to joists.

D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."

E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."

F. Camber joists according to SJI's "Specifications.".

G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.

1. Joist Type: LH-series steel joists DLH-series steel joists.
2. End Arrangement: Underslung.
3. Top-Chord Arrangement: Parallel Pitched 1/4 inch per 12 inches, one way Pitched 1/4 inch per 12 inches, two ways.

B. Provide holes in chord members for connecting and securing other construction to joists.

C. Camber long-span steel joists according to SJI's "Specifications." Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.5 JOIST GIRDERS

A. Manufacture joist girders according to "Standard Specification for Joist Girders" in SJI's "Specifications," with steel-angle top- and bottom-chord members; with end and top-chord arrangements as indicated.

1. End Arrangement: Underslung with bottom-chord extensions.
2. Top-Chord Arrangement: Parallel Pitched 1/4 inch per 12 inches, one way Pitched 1/4 inch per 12 inches, two ways.

B. Provide holes in chord members for connecting and securing other construction to joist girders.

C. Camber joist girders according to SJI's "Specifications." Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.6 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.7 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. High-Strength Bolts, Nuts, and Washers: ASTM F 3125/F 3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436/F 436M, Type 1, hardened carbon-steel washers.

C. Welding Electrodes: Comply with AWS standards.

D. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.8 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2.

B. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - Shop priming of joists and joist accessories is specified in EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2 or power-tool cleaning according to SSPC-SP 3.
2. Apply a compatible primer of same type as primer used on adjacent surfaces.

END OF SECTION 05 21 00

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof deck.
2. Acoustical roof deck.
3. Composite floor deck.
4. Noncomposite form deck.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 05 12 00 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 05 50 00 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.
2. Canam Steel Corporation; Canam Group, Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.
11. Roof Deck, Inc.
12. Valley Joist.
13. Verco Decking, Inc., a Nucor company.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated.
6. Side Laps: As indicated.

2.3 ACOUSTICAL ROOF DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. ASC Profiles, Inc.
2. Canam Steel Corporation; Canam Group, Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.
5. Cordeck.
6. CSi Metal Dek Group.
7. DACS, Inc.
8. Epic Metals Corporation.
9. Marlyn Steel Decks, Inc.
10. New Millennium Building Systems, LLC.
11. Nucor Corp.
12. Roof Deck, Inc.

C. Acoustical Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated.
6. Acoustical Perforations: Deck units with manufacturer's standard perforated vertical webs.

7. Sound-Absorbing Insulation: Manufacturer's standard premolded roll or strip of glass or mineral fiber.

   a. Factory install sound-absorbing insulation into cells of cellular deck.

8. Acoustical Performance: NRC 0.65, tested according to ASTM C 423.

2.4 COMPOSITE FLOOR DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.
2. Canam Steel Corporation; Canam Group, Inc.
3. CMC Joist & Deck.
4. Consolidated Systems, Inc.
5. Cordeck.
6. DACS, Inc.
7. Epic Metals Corporation.
8. Marlyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
10. Nucor Corp.
11. Roof Deck, Inc.
12. Verco Decking, Inc., a Nucor company.

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G90 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.

2.5 NONCOMPOSITE FORM DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASC Profiles, Inc.
2. Canam Steel Corporation; Canam Group, Inc.
3. CMC Joist & Deck.
4. Cordeck.
5. CSi Metal Dek Group.

6. DACS, Inc.
7. Marlyn Steel Decks, Inc.
8. New Millennium Building Systems, LLC.
9. Nucor Corp.
10. Roof Deck, Inc.
11. Valley Joist.
12. Verco Decking, Inc., a Nucor company.

B. Noncomposite Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Uncoated Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade 33 minimum.

2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.

3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated.

2.6 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi , not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi , of same material and finish as deck, and of thickness and profile indicated.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0598 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

K. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch , nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, as indicated, and as follows:

1. Mechanically fasten with self-drilling, No. 12 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches , with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified per manufacturer.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch , nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches , and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches , with end joints as follows:

1. End Joints: Butted.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.6 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

END OF SECTION 05 31 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for operable partitions.
2. Steel framing and supports for overhead doors.
3. Steel framing and supports for countertops.
4. Steel framing and supports for [healthcare] [laboratory] equipment.
5. Steel tube reinforcement for low partitions.
6. Steel framing and supports for mechanical and electrical equipment.
7. Steel framing and supports for applications where framing and supports are not specified in other Sections.
8. Elevator machine beams, hoist beams, and divider beams.
9. Steel shapes for supporting elevator door sills.
10. Slotted channel framing.
11. Shelf angles.
12. Metal ladders.
13. Ladder safety cages.
14. Metal floor plate and supports.
15. Miscellaneous steel trim including [steel angle corner guards] [steel edgings] [and] [loading-dock edge angles].
16. Metal bollards.
17. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Section 04 20 00 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

2. Section 05 12 00 "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.
3. Section 07 72 00 "Roof Accessories" for manufactured metal roof walkways and metal roof stairs.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Shop primers.
2. Slotted channel framing.
3. Metal bollards.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for operable partitions.
2. Steel framing and supports for overhead doors.
3. Steel framing and supports for countertops.
4. Steel tube reinforcement for low partitions.
5. Steel framing and supports for mechanical and electrical equipment.
6. Steel framing and supports for applications where framing and supports are not specified in other Sections.
7. Elevator machine beams, hoist beams, and divider beams.
8. Steel shapes for supporting elevator door sills.
9. Shelf angles.
10. Metal ladders.
11. Ladder safety cages.
12. Metal floor plate and supports.
13. Metal bollards.
14. Loose steel lintels.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance of Steel Ladders: Ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

D. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

E. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

F. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: As indicated.

2. Material: Galvanized steel, ASTM A653/A653M, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

F. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

G. Post-Installed Anchors: chemical anchors or mechanical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

H. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 09 91 13 "Exterior Painting." Section 09 91 23 "Interior Painting."

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

H. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located in exterior walls.

D. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3, except for elevator pit ladders.
2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

2.9 LADDER SAFETY CAGES

A. General:

1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless steel fasteners.
2. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.
3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless steel fasteners unless otherwise indicated.

B. Steel Ladder Safety Cages:

1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
2. Secondary Intermediate Hoops: 1/4-by-2-inch flat bar hoops.
3. Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.
4. Galvanize and prime ladder safety cages, including brackets and fasteners.

2.10 METAL FLOOR PLATE

A. Fabricate from rolled-steel floor plate of thickness indicated below:

1. Thickness: As indicated.

B. Provide grating sections where indicated, fabricated from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 1/2 inch in least dimension.

C. Provide steel angle supports as indicated.

D. Include steel angle stiffeners and fixed and removable sections as indicated.

E. Provide flush steel bar drop handles for lifting removable sections, one at each end of each section.

2.11 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe.

B. Fabricate bollards with 3/8-inch- thick, steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch anchor bolts.

1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Prime steel bollards with zinc-rich primer.

2.12 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Prime plates with zinc-rich primer.

2.13 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Galvanize loose steel lintels located in exterior walls.

2.14 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.15 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.16 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions overhead doors securely to, and rigidly brace from, building structure.

C. Anchor shelf angles securely to existing construction as indicated.

3.3 INSTALLATION OF METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.

1. Do not fill removable bollards with concrete.

B. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch toward bollard.

C. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

3.4 INSTALLATION OF BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in [Section 09 91 13 "Exterior Painting."] [Section 09 91 23 "Interior Painting."]

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 50 00

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SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with timber.
3. Framing with engineered wood products.
4. Rooftop equipment bases and support curbs.
5. Wood blocking, cants, and nailers.
6. Wood furring.
7. Wood sleepers.
8. Plywood backing panels.

B. Related Requirements:

1. Section 06 13 00 "Heavy Timber Construction."
2. Section 06 16 00 "Sheathing" for sheathing, subflooring, and underlayment.
3. Section 06 17 53 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

C. Exposed Framing: Framing not concealed by other construction.

D. OSB: Oriented strand board.

E. Timber: Lumber of 5 inches nominal size or greater in least dimension.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Standard, Stud, or No. 3 grade.

1. Application: Interior partitions not indicated as load bearing.
2. Species:

a. Spruce-pine-fir; NLGA.

B. Load-Bearing Partitions: As indicated on drawings.

1. Application: Exterior walls and interior load-bearing partitions.

C. Joists, Rafters, and Other Framing Not Listed Above: As indicated on drawings.

2.5 ENGINEERED WOOD PRODUCTS

A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

B. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Boise Cascade Corporation.
b. Finnforest USA.
c. Georgia-Pacific Building Products.
d. Jager Building Systems Inc.
e. Louisiana-Pacific Corporation.
f. Pacific Woodtech Corporation.
g. Roseburg Forest Products.
h. Standard Structures Inc.
i. Stark Truss Company, Inc.
j. West Fraser Timber Co., Ltd.
k. Weyerhaeuser Company.

C. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Louisiana-Pacific Corporation.
b. Weyerhaeuser Company.

D. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Comply with material requirements of and with structural capacities established and monitored according to ASTM D 5055.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Anthony-Domtar Inc.
b. Boise Cascade Corporation.
c. Georgia-Pacific Building Products.
d. International Beams Inc.
e. International Paper Corporation.
f. J. M. Huber Corporation.
g. Jager Building Systems Inc.
h. Louisiana-Pacific Corporation.
i. Nascor Incorporated.
j. Pacific Woodtech Corporation.
k. Roseburg Forest Products.
l. Standard Structures Inc.
m. Stark Truss Company, Inc.
n. Superior Wood Systems.

o. Weyerhaeuser Company.

2. Web Material: Either OSB or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
3. Structural Properties: Depths and design values not less than those indicated.
4. Comply with APA PRI-400. Factory mark I-joists with APA-EWS trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA-EWS standard.

E. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research or evaluation report for I-joists.

1. Manufacturer: Provide products by same manufacturer as I-joists.
2. Material: product made from any combination solid lumber, wood strands, and veneers.
3. Comply with APA PRR-401, rim board grade. Factory mark rim boards with APA-EWS trademark indicating thickness, grade, and compliance with APA-EWS standard.

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Utility shelving.

B. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.7 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C , fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.8 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fastenersof Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC58 ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.9 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.

B. Allowable design loads, as published by manufacturer, shall meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

E. Stainless-Steel Sheet: ASTM A 666, Type 304.

1. Use for exterior locations and where indicated.

F. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.

G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch- minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.

H. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

I. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long.

J. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.

2.10 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

L. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

M. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

N. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

O. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring vertically at 24 inches o.c.

C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- size furring vertically at 16 inches o.c.

3.4 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.

1. For exterior walls, provide 2-by-6-inch nominal- size wood studs spaced 16 inches o.c. unless otherwise indicated.
2. For interior partitions and walls, provide 2-by-6-inch nominal- 2-by-4-inch nominal- size wood studs spaced 16 inches o.c. unless otherwise indicated.
3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.

3.5 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. Where supported on wood members, by toe nailing or by using metal framing anchors.
2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.

C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches from top or bottom.

E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

H. Provide solid blocking between joists under jamb studs for openings.

I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.

1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- size lumber, double-crossed and nailed at both ends to joists.
2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.6 TIMBER FRAMING INSTALLATION

A. Install timber beams with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports as indicated if not continuous.

B. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch airspace at sides and ends of wood members.

C. Install wood posts using metal anchors indicated.

D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.7 STAIR FRAMING INSTALLATION

A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:

1. Size: 2-by-12-inch nominal size, minimum.
2. Material: Laminated-veneer lumber.
3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
4. Spacing: At least three framing members for each 36-inch clear width of stair.

B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.8 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

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SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Parapet sheathing.
4. Composite nail base insulated roof sheathing.
5. Subflooring.
6. Underlayment.
7. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for plywood backing panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.

1. Show locations and extent of sheathing, accessories, and assemblies specific to Project conditions.
2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

B. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing Performance: Air-barrier and water-resistant glass-mat gypsum sheathing assembly, and seals with adjacent construction, shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.2 WOOD PANEL PRODUCTS

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings, and the following:

1. Roof and wall sheathing within 48 inches of fire walls.

2.5 WALL SHEATHING

A. Plywood Sheathing: As indicated.

B. Oriented-Strand-Board Sheathing: DOC PS 2, as indicated.

C. Paper-Surfaced Gypsum Sheathing: ASTM C1396/C1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum.
b. Georgia-Pacific Gypsum LLC.
c. National Gypsum Company.
d. Temple-Inland Building Products by Georgia-Pacific.
e. USG Corporation.

2. Type and Thickness: As indicated.
3. Edge and End Configuration: Square.

D. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corporation.
b. Continental Building Products, LLC.
c. Georgia-Pacific Gypsum LLC.
d. National Gypsum Company.
e. Temple-Inland Building Products by Georgia-Pacific.
f. USG Corporation.

2. Type and Thickness: As indicated.

E. Cementitious Backer Units: ASTM C1325, Type A.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. C-Cure.
b. Custom Building Products.
c. FinPan, Inc.
d. USG Corporation.

2. Thickness: As indicated.

2.6 ROOF SHEATHING

A. Plywood Sheathing: As indicated.

B. Oriented-Strand-Board Sheathing: DOC PS 2, as indicated.

2.7 PARAPET SHEATHING

A. Plywood Sheathing: As indicated.

B. Oriented-Strand-Board Sheathing: DOC PS 2, as indicated.

C. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. CertainTeed Corporation.
    b. Georgia-Pacific Gypsum LLC.
    c. National Gypsum Company.
    d. Temple-Inland Building Products by Georgia-Pacific.
    e. USG Corporation.

2. Type and Thickness: As indicated.

2.8 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING

A. Vented, Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: ASTM C1289, Type II, Class 1, with DOC PS 2, Exposure 1 oriented strand board adhered to spacers on one face.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Atlas EPS; a Division of Atlas Roofing Corporation.
    b. Cornell Corporation.
    c. Dow Chemical Company (The).
    d. Hunter Panels.
    e. Johns Manville; a Berkshire Hathaway company.
    f. Rmax, Inc.

2. Polyisocyanurate-Foam Thickness: As indicated.

2.9 SUBFLOORING AND UNDERLAYMENT

A. Plywood Subflooring: single-floor panels or sheathing, as indicated.

B. Underlayment: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch over smooth subfloors and not less than 3/8 inch overboard or uneven subfloors.

1. Plywood Underlayment for Resilient Flooring: DOC PS 1, as indicated. with fully sanded face.
2. Plywood Underlayment for Ceramic Tile: DOC PS 1, Exterior, C-C Plugged, not less than 5/8-inch nominal thickness.
3. Plywood Underlayment for Carpet: DOC PS 1, as indicated.

2.10 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
2. For roof parapet wall sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C1002.
2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C954.

G. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117. Provide washers or plates if recommended by sheathing manufacturer.

2.11 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Paper-Surfaced or Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 07 92 00 "Joint Sealants."

B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

2.12 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall parapet roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Subflooring:

a. Glue and screw to wood framing.
b. Screw to cold-formed metal framing.
c. Space panels 1/8 inch apart at edges and ends.

2. Wall and Roof Sheathing:

a. Nail to wood framing.
b. Screw to cold-formed metal framing.
c. Space panels 1/8 inch apart at edges and ends.

3. Underlayment:

a. Nail to subflooring.
b. Space panels 1/32 inch apart at edges and ends.
c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to wood framing with nails or screws.
2. Fasten gypsum sheathing to cold-formed metal framing with screws.
3. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
4. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.4 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.5 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Testing and Inspecting Agency: Engage a qualified testing agency to perform tests and inspections.

C. Inspections: Air-barrier and water-resistant glass-mat gypsum sheathing, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
3. Termination mastic has been applied on cut edges.
4. Strips and transition strips have been firmly adhered to substrate.
5. Compatible materials have been used.
6. Transitions at changes in direction and structural support at gaps have been provided.
7. Connections between assemblies (sheathing and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
8. All penetrations have been sealed.

D. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier sheathing assemblies will be tested for evidence of air leakage according to ASTM E1186, chamber pressurization or depressurization with smoke tracers.
2. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E783 or ASTM E2357.

E. Air barriers will be considered defective if they do not pass tests and inspections.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

END OF SECTION 06 16 00

SECTION 06 20 23 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior trim.
2. Interior board paneling.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
2. Section 09 91 23 "Interior Painting" for priming and backpriming of interior finish carpentry.

1.3 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. MDO: Plywood with a medium-density overlay on the face.

C. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.

2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.

1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
2. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

B. Hardboard: ANSI A135.4.

2.2 INTERIOR TRIM

A. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):

1. Species and Grade: As indicated on drawings; NHLA .
2. Maximum Moisture Content: 13 percent.
3. Finger Jointing: Not allowed.
4. Gluing for Width: Allowed .
5. Veneered Material: Allowed .
6. Face Surface: Surfaced (smooth).
7. Matching: Selected for compatible grain and color.

PANELING

A. Board Paneling: Interior wood-board paneling complying with MMPA WM 9.

1. Species: As indicated on drawings.
2. Grade: Clear No. 1 .
3. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less .

FABRICATION

A. Back out or kerf backs of the following members, except those with ends exposed in finished work:

1. Interior standing and running trim, except shoe and crown molds.
2. Wood-board paneling.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.

1. Do not use pieces less than 24 inches long, except where necessary.
2. Stagger joints in adjacent and related standing and running trim.
3. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
4. Use scarf joints for end-to-end joints.
5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
6. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
7. Install trim after gypsum-board joint finishing operations are completed.
8. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
9. Fasten to prevent movement or warping.
10. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 PANELING INSTALLATION

A. Board Paneling: Install according to manufacturer's written instructions.

1. Arrange in random-width pattern suggested by manufacturer unless boards or planks are of uniform width.
2. Install in full lengths without end joints.
3. Stagger end joints in random pattern to uniformly distribute joints on each wall.
4. Install with uniform end joints with only end-matched (tongue-and-groove) joints within each field of paneling.
5. Install with uniform end joints. Locate end joints only over furring or blocking.
6. Select and arrange boards on each wall to minimize noticeable variations in grain character and color between adjacent boards.
7. Install with uniform tight joints between boards.
8. Fasten paneling by face nailing, setting nails, and filling over nail heads.
9. Fasten paneling with trim screws, set below face and filled.
10. Fasten paneling by blind nailing through tongues.
11. Fasten paneling with paneling system manufacturer's concealed clips.
12. Fasten paneling to gypsum wallboard with panel adhesive.

3.6 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements.

1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

B. Adjust joinery for uniform appearance.

3.7 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces.

B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.8 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 23

SECTION 06 41 16 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Section 12 36 23.13 "Plastic-Laminate-Clad Countertops."

1.3 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 08 71 00 "Door Hardware" to manufacturer of architectural cabinets; coordinate Shop Drawings and fabrication with hardware requirements.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.

3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.
5. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.

D. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 inches, for each type, color, pattern, and surface finish required.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

1.7 CLOSEOUT SUBMITTALS

A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.8 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.

B. Installer Qualifications: Licensed participant in AWI's Quality Certification Program.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide labels from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.
2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Architectural Woodwork Standards Grade: Custom.

C. Type of Construction: Frameless.

D. Door and Drawer-Front Style: Flush overlay.

1. Reveal Dimension: As indicated.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Abet Laminati Inc.
b. Formica Corporation.
c. Lamin-Art, Inc.
d. Pionite; a Panolam Industries International, Inc. brand.
e. Wilsonart.

F. Laminate Cladding for Exposed Surfaces:

1. Horizontal Surfaces: Grade VGS.
2. Postformed Surfaces: Grade VGS.
3. Vertical Surfaces: Grade VGS.
4. Edges: Grade VGS.
5. Pattern Direction: As indicated.

G. Materials for Semi-exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

a. Edges of Plastic-Laminate Shelves: PVC tape, 0.018-inch minimum thickness, matching laminate in color, pattern, and finish.
b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
c. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.

2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

H. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

J. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

K. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Match Architect's sample.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.
2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
4. Mill lumber before treatment and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of architectural cabinets.

C. Fire-Retardant Particleboard: Made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

1. For panels 3/4 inch thick and less, comply with ANSI A208.1 for Grade M-2 except for the following minimum properties: modulus of rupture, 1600 psi; modulus of elasticity, 300,000 psi; internal bond, 80 psi; and screw-holding capacity on face and edge, 250 and 225 lbf, respectively.
2. For panels 13/16 to 1-1/4 inches thick, comply with ANSI A208.1 for Grade M-1 except for the following minimum properties: modulus of rupture, 1300 psi; modulus of elasticity, 250,000 psi; linear expansion, 0.50 percent; and screw-holding capacity on face and edge, 250 and 175 lbf, respectively.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Arauco North America.
    b. Timber Products Company.

D. Fire-Retardant Fiberboard: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Panel Source International, Inc.
    b. Roseburg Forest Products.

2.4 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 08 71 00 "Door Hardware."

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Accuride International.
    b. Blum, Julius & Co., Inc.
    c. Knape & Vogt Manufacturing Company.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

F. Shelf Rests: BHMA A156.9, B04013; metal two-pin with shelf hold-down clip.

G. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer.

    a. Type: Full extension.
    b. Material: Zinc-plated steel with polymer rollers.

2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-overtravel-extension type; zinc-plated-steel ball-bearing slides.
3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
4. For drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
6. For computer keyboard shelves, provide Grade 1HD-100.
7. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.

H. Door Locks: BHMA A156.11, E07121.

I. Drawer Locks: BHMA A156.11, E07041.

J. Door and Drawer Silencers: BHMA A156.16, L03011.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base; match Architect's sample.
2. Bright Brass, Clear Coated: BHMA 605 for brass base; BHMA 632 for steel base.
3. Bright Brass, Vacuum Coated: BHMA 723 for brass base; BHMA 729 for zinc-coated-steel base.
4. Satin Brass, Blackened, Bright Relieved, Clear Coated: BHMA 610 for brass base; BHMA 636 for steel base.
5. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
6. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
7. Satin Stainless Steel: BHMA 630.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln-dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.6 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semi-exposed surfaces.

END OF SECTION 06 41 16

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SECTION 07 01 50.19 - PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Partial tear-off of roof areas indicated on Drawings.

B. Related Requirements:

1. Section 01 10 00 "Summary" for use of premises and for phasing requirements.

1.3 DEFINITIONS

A. EPS: Molded (expanded) polystyrene.

B. OSB: Oriented strand board.

C. Partial Roof Tear-off: Removal of selected components and accessories from existing roofing system.

D. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

E. Roof Re-Cover Preparation: Existing roofing system is to remain and be prepared for new roof installed over it.

1.4 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to partial roofing tear-off, including, but not limited to, the following:

a. Reroofing preparation, including roofing system manufacturer's written instructions.

b. Temporary protection requirements for existing roofing system components that are to remain.
c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
e. Existing roof deck conditions requiring Architect notification.
f. Existing roof deck removal procedures and Owner notifications.
g. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
h. Structural loading limitations of roof deck during reroofing.
i. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
j. HVAC shutdown and sealing of air intakes.
k. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
l. Asbestos removal and discovery of asbestos-containing materials.
m. Governing regulations and requirements for insurance and certificates if applicable.
n. Existing conditions that may require Architect notification before proceeding.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Temporary Roofing Submittal: Product data and description of temporary roofing system.

1. If temporary roof remains in place, include surface preparation requirements needed to receive permanent roof, and submit a letter from roofing manufacturer stating acceptance of the temporary roof and that its inclusion does not adversely affect the new roofing system's resistance to fire and wind or specified special warranty or its FM Approvals rating.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1. Include certificate that Installer is approved by warrantor of existing roofing system.
2. Include certificate that Installer is licensed to perform asbestos abatement.

B. Field Test Reports:

1. Fastener pull-out test report.

C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations.

1. Submit before Work begins.

D. Landfill Records: Indicate receipt and acceptance of demolished roofing materials and hazardous wastes, such as asbestos-containing materials, by a landfill facility licensed to accept them.

1.7 CLOSEOUT SUBMITTALS

A. Certified statement from <Insert name of manufacturer for existing warranted roof system> stating that existing roof warranty has not been affected by Work performed under this Section.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: [Approved by warrantor of existing roofing system to work on existing roofing] [and] [licensed to perform asbestos abatement in the state or jurisdiction where Project is located].

B. Regulatory Requirements:

1. Comply with governing EPA notification regulations before beginning roofing removal.
2. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.9 FIELD CONDITIONS

A. Existing Roofing System: EPDM roofing.

B. Owner will occupy portions of building immediately below reroofing area.

1. Conduct reroofing so Owner's operations are not disrupted.
2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
4. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.

    a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

1. A roof moisture survey of existing roofing system is available for Contractor's reference.
2. The results of an analysis of test cores from existing roofing system are available for Contractor's reference.
3. Construction Drawings and Project Manual for existing roofing system are provided for Contractor's convenience and information, but they are not a warranty of existing conditions. They are intended to supplement rather than serve in lieu of Contractor's own investigations. Contractor is responsible for conclusions derived from existing documents.

F. Limit construction loads on existing roof areas to remain, and existing roof areas scheduled to be reroofed to <Insert load> for rooftop equipment wheel loads and <Insert load> for uniformly distributed loads.

G. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

1. Remove only as much roofing in one day as can be made watertight in the same day.

H. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. Existing roof will be left no less watertight than before removal.
3. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

a. Hazardous materials will be removed by Owner under a separate contract.

I. Hazardous Materials: A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except according to procedures specified elsewhere in the Contract Documents.
3. Coordinate reroofing preparation with hazardous material remediation to prevent water from entering existing roofing system or building.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during reroofing, by methods and with materials so as not to void existing roofing system warranty issued by <Insert name of manufacturer for existing warranted roof system>.

1. Notify warrantor before proceeding with the Work.

2. Notify warrantor of existing roofing system on completion of reroofing, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect.

    a. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

A. EPS Insulation: ASTM C 578.

B. Plywood: DOC PS 1, Grade CD, Exposure 1.

C. OSB: DOC PS 2, Exposure 1.

2.2 TEMPORARY ROOFING MATERIALS

A. Design and selection of materials for temporary roofing are Contractor's responsibilities.

B. Sheathing Paper: Red-rosin type, minimum 3 lb/100 sq. ft..

C. Base Sheet: ASTM D 4601/D 4601M, Type II, nonperforated, asphalt-impregnated and -coated, glass-fiber sheet.

D. Glass-Fiber Felts: ASTM D 2178/D 2178M, Type IV, asphalt-impregnated, glass-fiber felt.

E. Asphalt Primer: ASTM D 41/D 41M.

F. Roofing Asphalt: ASTM D 312/D 312M, Type III or IV.

G. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approvals' RoofNav.

2.3 INFILL AND REPLACEMENT MATERIALS

A. Use infill materials matching existing roofing system materials unless otherwise indicated.

2.4 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Protect existing roofing system that is not to be reroofed.
2. Loosely lay 1-inch- minimum thick, EPS insulation over existing roofing in areas not to be reroofed.

    a. Loosely lay 15/32-inch plywood or OSB panels over EPS. Extend EPS past edges of plywood or OSB panels a minimum of 1 inch.

3. Limit traffic and material storage to areas of existing roofing that have been protected.
4. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
5. Comply with requirements of existing roof system manufacturer's warranty requirements.

B. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.

C. Shut off rooftop utilities and service piping before beginning the Work.

D. Test existing roof drains to verify that they are not blocked or restricted.

1. Immediately notify Architect of any blockages or restrictions.

E. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.

1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

F. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

G. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.

1. Prevent debris from entering or blocking roof drains and conductors.

    a. Use roof-drain plugs specifically designed for this purpose.
    b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.

    a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

A. Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.

B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.

C. Remove aggregate ballast from roofing. Store aggregate ballast for reuse in manner not to exceed structural loading limitations of roof deck.

D. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing using a power broom.

E. Remove pavers and accessories from roofing.

1. Store and protect pavers and accessories for reuse in manner not to exceed structural loading limitations of roof deck.
2. Discard cracked pavers.

F. Remove ballast, protection mat, and EPS insulation from protected roofing membrane.

1. Discard EPS insulation that is damaged or exceeds 8 lb/cu. ft..
2. Store EPS insulation for reuse and protect it from physical damage.
3. Store ballast for reuse in manner not to exceed structural loading limitations of roof deck.

G. Partial Roof Tear-off: Where indicated on Drawings, remove existing roofing down to [existing cover board] [existing insulation] <Insert substrate> and immediately check for presence of moisture.

1. Engage a qualified testing agency to perform the following test:

    a. Coordinate with Owner's testing agency to schedule times for tests and inspections immediately after removal.

2. Survey exposed substrate that is to remain using infrared color thermography according to ASTM C 1153.

    a. Prepare survey report of initial scan indicating locations of entrapped moisture, if any, and area calculations of locations of entrapped moisture.

3. Survey exposed substrate that is to remain using electrical capacitance/impedance testing according to ASTM D 7954/D 7954M.

    a. Prepare survey report indicating locations of entrapped moisture, if any, and area calculations of locations of entrapped moisture.

4. Survey exposed substrate that is to remain using nuclear hydrogen detection testing according to SPRI/RCI NT-1.

    a. Prepare survey report indicating locations of entrapped moisture, if any, and area calculations of locations of entrapped moisture.

5. Remove wet or damp materials below existing roofing and above deck as directed by Architect.

6. Inspect wood blocking, curbs, and nailers for deterioration and damage.

    a. If wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

7. Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry.

    a. Remove unadhered bitumen, unadhered felts, and wet felts.

8. Remove excess asphalt from steel deck that is exposed by removal of wet or damp materials.

    a. A maximum of 15 lb/100 sq. ft. of asphalt is permitted to remain on steel decks.

9. Remove fasteners from deck.

3.3 DECK PREPARATION

A. Inspect deck after tear-off of roofing system.

B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect.

    1. Do not proceed with installation until directed by Architect.

C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.

    1. Do not proceed with installation until directed by Architect.

D. Provide additional deck securement as indicated on Drawings.

E. Replace steel deck as indicated on Drawings.

F. Replace steel deck as directed by Architect.

    1. Deck replacement will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

G. Prepare and paint steel deck surface.

    1. Painting and preparation for painting is specified in Section 09 91 13 "Exterior Painting."

3.4 INFILL MATERIALS INSTALLATION

A. Immediately after roof tear-off, and inspection and repair, if needed, of deck, fill in tear-off areas to match existing roofing system construction.

B. Install new roofing patch over roof infill area.

1. If new roofing is installed the same day tear-off is made, roofing patch is not required.

3.5 TEMPORARY ROOFING

A. Install approved temporary roofing over area to be reroofed.

B. Install temporary roofing over area to be reroofed.

C. Remove temporary roofing before installing new roofing.

D. Prepare temporary roof to receive new roofing by patching and repairing temporary roofing.

1. Restore temporary roofing to watertight condition.
2. Obtain approval for temporary roof substrate from roofing manufacturer and Architect before installing new roof.

3.6 ROOF RE-COVER PREPARATION

A. Remove blisters, ridges, buckles, mechanically attached roofing fastener buttons projecting above roofing, and other substrate irregularities from existing roofing that inhibit new recover boards from conforming to substrate.

1. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.
2. Scarify surface of sprayed polyurethane foam as necessary to achieve a sufficiently uniform plane to receive new recover boards.
3. Broom clean existing substrate.
4. Coordinate with Owner's inspector to schedule times for tests and inspections.
5. Verify that existing substrate is dry.

a. Spot check substrates with an electrical capacitance moisture-detection meter.

6. Remove materials that are wet or damp.

a. Removal will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

B. Remove blisters, ridges, buckles, mechanically attached roofing fastener buttons projecting above roofing, and other substrate irregularities from existing roofing that inhibit new roofing from conforming to substrate.

1. Remove loose aggregate from aggregate-surfaced, built-up bituminous roofing with a power broom.
2. Shave surface of sprayed polyurethane foam as necessary to achieve a sufficiently uniform plane to receive new [recover boards] [roofing].
3. Broom clean existing substrate.
4. Coordinate with Owner's inspector to schedule times for tests and inspections.
5. Verify that existing substrate is dry before proceeding with installation.

    a. Spot check substrates with an electrical capacitance moisture-detection meter.

6. Remove materials that are wet and damp.

    a. Removal will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.

C. Remove blisters and areas of roofing not fully adhered.

3.7 BASE FLASHING REMOVAL

A. Remove existing base flashings.

1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are to remain.

C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage.

1. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

D. Remove existing parapet sheathing and replace with new parapet sheathing to comply with Section 06 16 00 "Sheathing."

1. If parapet framing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

3.8 FASTENER PULL-OUT TESTING

A. Perform fastener pull-out tests according to SPRI FX-1 and submit test report to Architect before installing new roofing system.

1. Obtain Architect's and roofing manufacturer's approval to proceed with specified fastening pattern.

    a. Roofing manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

3.9 DISPOSAL

A. Collect demolished materials and place in containers.

1. Promptly dispose of demolished materials.
2. Do not allow demolished materials to accumulate on-site.
3. Storage or sale of demolished items or materials on-site is not permitted.

B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 07 01 50.19

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SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK

A. Extent of the insulation work is shown on drawings.

B. Applications of insulation specified in this section include the following:

1. Foundation wall insulation
2. Masonry cavity wall insulation
3. Blanket-type building insulation
4. Spray-Applied Cellulosic insulation. insulation
5. Vapor retarder
6. Eave ventilation trough

B. Insulation in conjunction with roofing is specified as part of Section 07 53 23 – ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING.

C. Sound attenuation insulation in drywall partitions is specified as part of Section 09 29 00 – GYPSUM BOARD.

D. Insulation in conjunction with acoustical roof deck is specified as part of Section 05 31 00 – STEEL DECKING.

1.3 DEFINITIONS

A. Thermal Resistivity: Where the thermal resistivity of insulation products are designed by “r-values” they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1” thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Product data for each type of insulation product specified.

C. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of insulation products with requirements including r-values (aged values for plastic foam insulations), fire performance characteristics, perm ratings, water absorption ratings, and other properties, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Fire and Insurance Ratings: Comply with fire-resistance, flammability and insurance ratings indicated, and comply with governing regulations as interpreted by authorities.

B. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer’s recommendations for handling, storage, and protection during installation.

B. Protect insulation materials as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Foundation Wall Insulation: Provide rigid cellular thermal insulation complying with ASTM C-578, Type I, 0.90 pcf minimum density, aged R-value of 4.00 and 3.60 at 40°F and 75°F (4.4°C and 23.9°C) respectively. Provide 2" thicknesses unless otherwise indicated on drawings.

B. Cavity Wall Insulation: Polyisocyanurate Board, Glass-Fiber-Mat Faced: ASTM C 1289, glass-fiber-mat faced, Type II, Class 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

C. Mineral/Glass Fiber Blanket/Batt Insulation: Glass or other inorganic fibers, formed into flexible, resilient blankets or semi-rigid sheets; complying with FS HH-I-521; Type as indicated; density as indicated, but not less than 1.0 lb. per cu. ft.; approximate thermal conductivity (K-value at 75°F.) of 0.27; thickness as indicated; manufacturer's standard lengths and widths, as needed to coordinate with structural elements of spaces to be insulated.
1. Type I: Units without facing or membrane. Provide semi-rigid units where required for self-support by friction fit.

D. Spray-Applied Cellulosic insulation: Self-Supported, Spray-Applied Cellulosic Insulation: ASTM C 1149, Type III; (materials containing and adhesive mixed with water during application; intended for application on attic floors) chemically treated for flame resistance, processing and handling; passing ASTM standards for combustion characteristics.

E. Continuous Envelope Insulation: Polyisocyanurate Board, Glass-Fiber-Mat Faced: ASTM C 1289, glass-fiber-mat faced, Type II, Class 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 AUXILIARY INSULATING MATERIALS:

A. Polyethylene Vapor Retarder: Provide 8-mil polyethylene film, with laboratory tested vapor transmission rating of 0.2 perms, natural color.

B. Tape for Vapor Retarder: Pressure sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.

C. Eave Ventilation Trough: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with installer present, for compliance with requirements of the sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations.

3.3 INSTALLATION

A. General:

1. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.
2. Provide general building insulation as shown on drawings and as may be required to assure a well-insulated project. Apply insulation to substrate by mechanical anchorage as recommended by manufacturer to provide permanent placement and support of units.

B. Mineral Fiber Blanket Insulation:

1. Stuff unfaced glass fiber insulation into the spaces between the tops of walls and metal decking, where joists run perpendicular through walls and into miscellaneous voids and cavity spaces as indicated. Compact to approximately 40% of normal maximum volume (to a density of approximately 2.5 lbs. per cu. ft.).

C. Vapor Retarder Installation:

1. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those which have been stuffed with loose fiber-type insulation.
2.
3. Seal joints in vapor retarders over framing by lapping not less than two rigid insulation wall furring channels. Fasten vapor retarders to framing at all edges, at perimeter of openings and at lap joints.
4.
5. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.
6.
7. Seal joints caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with cloth or aluminized tape of type recommended by vapor retarder manufacturer to create an air-tight seal between penetrating objects and vapor retarder.
8. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with tape or another layer of vapor retarder.

3.4 PROTECTION:

A. General: Protect installed insulation and vapor retarders from harmful weather exposures and from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure. Installer shall advise Contractor of exposure hazards, including possible sources of deterioration and fire hazards.

END OF SECTION 07 21 00

SECTION 07 21 19 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam.

B. Related Requirements:

1. Section 07 21 00 "Thermal Insulation" for foam-plastic board insulation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 lb/cu. ft. and minimum aged R-value at 1-inchthickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. BASF Corporation.
b. CertainTeed Corporation.
c. Dow Chemical Company (The).
d. Gaco Western Inc.

e. Henry Company.

2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.

E. Cavity Walls: Install into cavities to thickness indicated on Drawings.

F. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 07 21 19

SECTION 07 26 00 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

Section Includes:

Polyethylene vapor retarders.

1. Reinforced-polyethylene vapor retarders.

1.3 ACTION SUBMITTALS

Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS

Polyethylene Vapor Retarders: ASTM D 4397, 10-mil- thick sheet, with maximum permeance rating of 0.1 perm.

2.2 REINFORCED-POLYETHYLENE VAPOR RETARDERS

Reinforced-Polyethylene Vapor Retarders: Sheet with outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 20 lb/1000 sq. ft., with maximum permeance rating of 0.1 perm.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Insulation Solutions, Inc.

a. Raven Industries Inc.

2.3 ACCESSORIES

Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

A. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

B. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.1 PREPARATION

Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS ON FRAMING

Place vapor retarders on side of construction indicated on Drawings.

A. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.3 INSTALLATION OF VAPOR RETARDERS IN CRAWL SPACES

Install vapor retarders over prepared grade. Lap joints a minimum of 12 inches and seal with manufacturer's recommended tape. Install second layer over pathways to equipment.

A. Extend vapor retarder over footings and seal to foundation wall or grade beam with manufacturer's recommended tape.

Extend vapor retarder vertically minimum 24 inches above top of footing.

Seal around penetrations such as utilities and columns in order to create a monolithic, airtight membrane at grade surface, perimeter, and all vertical penetrations.

3.4 PROTECTION

Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 07 26 00

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SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vapor-retarding, fluid-applied air barriers.
2. Vapor-permeable, fluid-applied air barriers.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [Project site] <Insert location>.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.[Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.]

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.3 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

A. High-Build, Vapor-Retarding Air Barrier: synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.

1. Synthetic Polymer Type:

a. Products: Subject to compliance with requirements, provide one of the following:

1) Grace Construction Products; W.R. Grace & Co. -- Conn.; Perm-A-Barrier Liquid.
2) Henry Company; Air-Bloc 32MR.
3) Tremco Incorporated; ExoAir 130.

2. Physical and Performance Properties:

a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
b. Vapor Permeance: Maximum 0.1 perm; ASTM E 96/E 96M, Desiccant Method.
c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.
d. Adhesion to Substrate: Minimum 30 lbf/sq. in. when tested according to ASTM D 4541.
e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
f. UV Resistance: Can be exposed to sunlight for 180 days according to manufacturer's written instructions.

2.4 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. High-Build, Vapor-Permeable Air Barrier: synthetic polymer membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.

1. Synthetic Polymer Type:

a. Products: Subject to compliance with requirements, provide one of the following:

1) Grace Construction Products; W.R. Grace & Co. -- Conn.; Perm-A-Barrier VP.
2) Henry Company, Sealants Division; Air-Bloc 31MR.
3) Tremco Incorporated; ExoAir 230.

2. Physical and Performance Properties:

a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M, Desiccant Method, Procedure A.
c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.
d. Adhesion to Substrate: Minimum 30 lbf/sq. in. when tested according to ASTM D 4541.
e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
f. UV Resistance: Can be exposed to sunlight for 180 days according to manufacturer's written instructions.

2.5 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints expansion joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.

2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.

1. Transition Strip: Roll firmly to enhance adhesion.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, transition strip.

H. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

I. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.

1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils , applied in one or more equal coats.
2. Vapor-Permeable, High-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, but not less than 35 mils , applied in one or more equal coats.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Air-barrier dry film thickness.
3. Continuous structural support of air-barrier system has been provided.
4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
5. Site conditions for application temperature and dryness of substrates have been maintained.
6. Maximum exposure time of materials to UV deterioration has not been exceeded.
7. Surfaces have been primed, if applicable.

8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
9. Termination mastic has been applied on cut edges.
10. Strips and transition strips have been firmly adhered to substrate.
11. Compatible materials have been used.
12. Transitions at changes in direction and structural support at gaps have been provided.
13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
14. All penetrations have been sealed.

D. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Location Testing: Air-barrier assemblies will be tested for evidence of air leakage according to ASTM E 1186, chamber pressurization or depressurization with smoke tracers .
2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 07 27 26

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SECTION 07 41 00 - FACTORY MANUFACTURED PREFORMED ROOF/ WALL PANELS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

1. This section covers the pre-finished, pre-fabricated exposed fastener metal roof and wall system. All metal trim, accessories, fasteners, insulation and sealants indicated on the drawings as part of this section.
2. Drawings and general provisions of the Contract, including general and Supplementary Conditions and Division 01 Specifications, apply to this section.
3. Related Work Specified Elsewhere
    1. Roof Deck structural steel, flat roof systems, perimeter edge systems. Roof hatches, firestopping not included in this section.

1.2 SUMMARY

1. Section Includes
    1. Factory formed exposed fastener metal roof and wall panels
2. Related work specified elsewhere. (Note: select from the below or add appropriate sections)
    1. Section 05 10 00 - Structural Steel
    2. Section 05 20 00 or 05 40 00 - Steel Joists
    3. Section 07 60 00 - Flashing and Sheet Metal

1.3 DEFINITIONS

1. Metal Roof/Wall Panel Assembly: Metal roof/ panels, attachment system components, miscellaneous metal framing, thermal, and accessories necessary for a complete weathertight roofing system.
2. References:
    1. American Society for Testing and Materials (ASTM)
        1. ASTM A 653: Steel Sheet, Zinc Coated by the Hot Dip Process
        2. ASTM A 792: Steel Sheet, Aluminum-Zinc Alloy Coated by the Hot Dip Process
        3. ASTM B 209: Aluminum and Aluminum Alloy Sheet and Plate
        4. ASTM B370 Standard Specification for Copper Sheet and Strip for Building Construction
    2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
        1. SMACNA Architectural Sheet Metal Manual, 1993 edition
    3. American Iron and Steel Institute (AISI)
        1. AISI Cold Formed Steel Design Manual
    4. Aluminum Association
        1. Aluminum Design Manual
    5. Metal Construction Association

1. Preformed Metal Wall Guidelines
6. Code References
    1. ASCE, Minimum Loads for Buildings and Other Structures
    2. IBC International Building Codes

1.4 QUALITY ASSURANCE

1. Petersen Aluminum Corp, Elk Grove Village, IL, 800-323-1960 products establish a minimum of quality required.
2. Manufacturer and erector shall demonstrate experience of a minimum of five (5) years in this type of project.
3. Panels shall be factory-produced only. No portable, installer-owned or installer-rented machines will be permitted.

1.5 SUBSTITUTIONS

1. The material, products and equipment specified in this section establish a standard for required function, dimension, appearance and quality to be met by any proposed substitution.
2. Manufacturers listed in this section are prequalified manufacturers. Substitution of manufacturer\'s products for those specified shall not be allowed at any time during construction.

1.6 SYSTEM DESCRIPTION

1. Material to comply with:
    1. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated by the Hot-Dip Process

1.7 ROOF SYSTEM PERFORMANCE TESTING

1. General Performance: Metal roof/wall panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation or other defects in construction.
2. Roof System shall be designed to meet Standard Building Code Wind Load requirements.
3. Panels to meet:
    1. Roof/Wall System shall be designed to meet applicable Local Building Code and the System shall have tested by the Manufacturer per ASTM E-1592 and have the applicable Load Tables published from this testing for loads.

1.8 WARRANTIES

A. Finish warranty: Manufacturer's standard form in which manufacturer agrees to repair finish or replace standing seam metal roof panels that show evidence of deterioration of factory-applied finish within specified warranty period.
    1. Exposed Panels Finish - deterioration includes the following:

a. Color fading more than 5 hunter units when tested according to ASTM D 2244
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214
c. Cracking, checking, peeling or failure of a paint to adhere to a bare metal.

2. Warranty Period: 20 Years from the date of substantial completion

B. Applicator shall furnish written warranty for a two (2) year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight condition.

1.9 SUBMITTALS

1. Furnish detailed drawings showing profile and gauge of exterior sheets, location and type of fasteners, location, gauges, shape and method of attachment of all trim locations and types of sealants, and any other details as may be required for a weather-tight installation.
2. Provide finish samples of all colors specified.
3. Shop drawings: Show fabrication and installation layouts of metal roof panels, metal wall panels or metal soffit panels, details of edge conditions, side-seam joints, panel profiles, corners, anchorages, trim, flashings, closures and accessories, and special details. Distinguish between factory and field-assembled work
4. Coordination Drawings: Roof plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installer of the items involved:
    1. Roof panels and attachments
    2. Metal trusses, bracings and supports
    3. Roof-mounted items including snow guards and items mounted on roof curbs.

1.10 DELIVERY, STORAGE AND HANDLING

1. Ordering: Comply with manufacturer\'s ordering instruction and lead time requirements to avoid construction delays.
2. Deliver components, sheets, metal roof/wall panels and other manufactured items so as not to be damaged or deformed. Package metal roof/wall panels for protection during transportation and handling.
3. Unload, store and erect metal roof/wall panels in a manner to prevent bending, warping, twisting and surface damage.
4. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof/wall panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting or other surface damage.
5. Protect strippable protective coating on any metal coated product from exposure to sunlight and high humidity, except to the extent necessary for material installation.

1.11 PROJECT CONDITIONS

1. Weather Limitations: proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed.

2. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.12 COORDINATION

1. Coordinate sizes and locations of roof curbs, equipment supports and roof penetrations with actual equipment provided.
2. Coordinate metal roof panels with rain drainage work, flashing, trim and construction of decks, parapet walls and other adjoining work to provide a leakproof, secure and noncorrosive installation.

PART 2 - PRODUCTS

2.1 PANEL DESIGN

1. General: Provide factory-formed, prefinished, lappable exposed fastener, structural ribbed metal roof/wall panel system, that has been pretested and certified by manufacturer to comply with specified requirements under installed conditions.
2. Corrugated panels, with 2.67\" x 7/8\" deep profile ribs, total coverage of Roof/Wall panels when installed shall be 34.67\" coverage with 2 lapped ribs for roofing and 37.33\" coverage with 1 lapped rib for siding.
3. Structural Requirements: Engineer panels for structural properties in accordance with latest edition of American Iron and Steel Institute\'s Cold Formed Steel Design Manual using effective width concept and Aluminum Associations Aluminum Design Manual.
4. Forming: Use continuous end rolling method. No end laps on panels. No portable rollforming machines will be permitted on this project, no installer-owned or installer-rented machines will be permitted. It is the intent of the Architect to provide Factory-Manufactured panel systems only for this project.
5. Panels shall be directly fastened to the substrate.
6. The panel shall have an overlapping sidelap feature.

2.2 ACCEPTABLE MANUFACTURERS

1. This project is detailed around the roofing/wall product of Petersen Aluminum Corporation Petersen Aluminum Corp, Elk Grove Village, IL, 800-323-1960, 1/2 & 7/8 Corrugated.

2.3 MATERIALS AND FINISHES

1. Preformed roofing panels shall be fabricated of 24 GA Steel
2. Color: As indicated on drawings.
3. Texture: Panel shall be smooth.
4. Finish shall be Kynar 500 or Hylar 5000 Fluorocarbon coating with a top side film thickness of 0.70 to 0.90 mil over a 0.25 to 0.3 mil prime coat to provide a total dry film thickness of 0.95 to

1.25 mil, to meet AAMA 621. Bottom side shall be coated with a primer with a dry film thickness of 0.25 mil. Finish shall conform to all tests for adhesions, flexibility and longevity as specified by Kynar 500 or Hylar 5000 finish supplier.

5. If Strippable coating to be applied on the pre-finished panels to the top side to protect the finish during fabrication, shipping and handling, film shall be removed before installation.
6. Trim: Trim shall be fabricated of the same material and finish to match the profile, and will be press broken in lengths of 10 to 12 feet. Trim shall be formed only by the manufacturer of their approved dealer. Trim to be erected in overlapped condition. Use lap strips only as indicated on drawings. Miter conditions shall be factory welded material to match the sheeting. Trim to be fabricated in accordance with standard SMACNA procedure and details.
7. Closures: shall be pre-molded polyethylene to match the profile of the exposed fastener panel and shall be in lengths as supplied by the panel manufacturer.
8. Accessories/Fasteners: Fasteners shall be of type, material, size, corrosion resistance, holding power and other properties required to fasten miscellaneous framing members to substrates. Accessories and their fasteners shall be capable of resisting the specified design wind uplift forces and shall allow for thermal movement of the roof panel system. Exposed fasteners shall not restrict free movement of the roof panel system resulting from thermal forces, except at designed points of roof panel fixity
    1. Fasteners shall have combination steel and EPDM washers
    2. Screws for panel to girt/purlins shall be sufficient to penetrate the supporting member by 1\". All fasteners shall be applied in accordance with the fastening schedule as provided by panel manufacturer.
    3. Screws for flashings and sidelaps shall be #14 HHA x 3/4\" sheet metal stitch screws. All accessories, flashings and sidelaps shall be fastened 12\" OC.
9. Substrate shall be horizontal hat channels as indicated on drawings.
10. Caulking: Shall be a polyurethane where it is exposed and there is no thermal movement. All caulking and sealing shall be done in a neat manner with excess caulking or sealant removed from exposed surfaces.
11. Caulking shall be non-skinning, non hardening gun grade butyl sealant or butyl sealant tape with a minimum thickness of ?\" where it is concealed and where thermal movement must be accommodated. All caulking or sealing shall be done in a neat manner with excess caulking or sealant removed from exposed surfaces.
12. Vapor Retarder: retarder with a permeance of 0.05 or less as determined by ASTM 98.

2.4 FABRICATION

1. Comply with dimensions, profile limitations, gauges and fabrication details shown and if not shown, provide manufacturer\'s standard product fabrication.
2. Fabricate components of the system in factory, ready for field assembly.
3. Fabricate components and assemble units to comply with fire performance requirements specified.
4. Apply specified finishes in conformance with manufacturer\'s standard, and according to manufacturer\'s instructions.
5. Panels are lappable. It is recommended that individual aluminum roof panels not exceed 16\' in length and steel roof panels not exceed 32\' in length for thermal movement reasons.

6. Panels shall be roll formed on a stationary industrial type rolling mill to gradually shape the sheet metal. Portable rollformers rented or owned by the installer, are not acceptable.

PART 3 - EXECUTION

3.1 INSPECTION

1. Examine alignment of structural steel and related supports, primary and secondary roof framing, solid roof sheathing, prior to installation. Components should comply with shop drawings and be smooth, even, sound and free of depressions.
2. For the record, prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FASTENERS

1. Secure units to supports
2. Place fasteners as indicated in manufacturer\'s standards.

3.3 INSTALLATION

1. Panels shall be installed plumb and true in a proper alignment and in relation to the structural framing. The erector must have at least five years successful experience with similar applications.
2. Install metal panels, fasteners, trim and related sealants in accordance with approved shop drawings and as may be required for a weather-tight installation. Conform to standards set forth in SMACNA architectural sheet metal manuals and approved shop drawings for this project.
3. Remove all strippable coating and provide a dry-wipe down cleaning of the panels as they are erected.
4. Install panel system so it is watertight, without waves, warps, buckles or distortions, and allow for thermal movement considerations.
5. Abrasive devices shall not be used to cut on or near roof or wall panel system.
6. Apply sealant tape or caulking as necessary at flashing and panel joints to prevent water penetration.
7. Remove any strippable film immediately upon exposure to direct sunlight.
8. Vapor retarder: The joints, perimeter, and all openings shall be sealed per the manufacturer\'s instructions to provide a continuous vapor retarder.
9. Underlayment (solid substrate):
    1. Provide one layer of 30# felt with horizontal overlaps and endlaps staggered between layers.
    2. Provide ice and water shield membrane at all valley and eave conditions as well as any area at less than a 3:12 slope.
    3. Lay parallel to ridge line with 2 1/2\" horizontal laps and 6\" vertical laps

3.4 DAMAGED MATERIAL

1. Upon determination of responsibility, repair or replace damaged metal panels and trim to the satisfaction of the Architect and Owner.

END OF SECTION 07 41 00

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SECTION 07 53 23 – EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes adhered membrane roofing system.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other Work.

C. Samples: For each product included in membrane roofing system.

D. Research/evaluation reports.

E. Maintenance data.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Source Limitations: Obtain components for membrane roofing system approved by roofing membrane manufacturer.

C. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Exterior Fire-Test Exposure: Class C; ASTM E 108, for application and roof slopes indicated.

D. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EPDM ROOFING MEMBRANE

A. EPDM Roofing Membrane: ASTM D 4637, Type I, nonreinforced uniform, flexible sheet made from EPDM, and as follows:
1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

a. Carlisle SynTec Incorporated.
b. Firestone Building Products Company.
c. Versico Inc.

2. Thickness: 60 mils, nominal.
3. Exposed Face Color: Black.

2.2 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive.

D. Seaming Material: Manufacturer's standard synthetic-rubber polymer primer and 3-inch- wide minimum, butyl splice tape with release film.

E. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

F. Miscellaneous Accessories: Provide lap sealant, water cutoff mastic, metal termination bars, metal battens, pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.3 ROOF INSULATION

A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.

B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches, unless otherwise indicated.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.4 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

B. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

2.5 ROOF PAVERS

A. Heavyweight Roof Pavers: Heavyweight, hydraulically pressed, concrete units, square edged, factory cast for use as roof pavers; absorption not greater than 5 percent, ASTM C 140; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C 67; and as follows:
   1. Size: 24 by 24 inches. Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch in length, height, and thickness.
   2. Weight: 18 lb/sq. ft.
   3. Compressive Strength: 6500 psi, minimum.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

3.2 ADHERED ROOFING MEMBRANE INSTALLATION

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry. Do not apply bonding adhesive to splice area of roofing membrane.

D. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

E. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

F. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping roofing membranes according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of roofing membrane terminations.

G. Repair tears, voids, and lapped seams in roofing that does not meet requirements.

3.3 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.4 WALKWAY INSTALLATION

A. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways. Leave 3 inches of space between adjacent roof pavers.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

C. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

END OF SECTION 07 53 23

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed roof-drainage sheet metal fabrications.
3. Formed low-slope roof sheet metal fabrications.
4. Formed wall sheet metal fabrications.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Distinguish between shop- and field-assembled work.
3. Include identification of finish for each item.
4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.

C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.7 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install copings tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209 , alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

2. Color: Custom to match Architect's sample.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; finish.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft.minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
4. Fasteners for Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn96, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.5 MANUFACTURED REGLETS

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions andwith interlocking counterflashing on exterior face, of same metal as reglet.

1. Material: Galvanized steel, 0.022 inch thick.
2. Finish: Mill .

2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Obtain field measurements for accurate fit before shop fabrication.
2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

F. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter brackets and gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.

B. Downspouts: Fabricate open-face downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.

1. Fabricate from the following materials:

a. Aluminum: 0.024 inch thick.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and interior leg. Miter corners, fasten and seal watertight.

1. Fabricate from the Following Materials:

a. Aluminum: 0.050 inch thick.

B. Base Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

C. Counterflashing and Flashing Receivers: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

2.9 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch- high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder aluminum sheet.
2. Do not use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
4. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters: Join sections with joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.

D. Expansion-Joint Covers: Install expansion-joint covers at locations and of configuration indicated. Lap joints minimum of 4 inches in direction of water flow.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 07 62 00

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SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof curbs.
2. Roof hatches.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with [roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.6 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design [roof curbs] [and] [equipment supports] to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind-Restraint Performance: [As indicated on Drawings] <Insert requirements>.

2.2 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Supported Load Capacity: Coordinate load capacity with information on Shop Drawings of equipment to be supported.

D. Material: Zinc-coated (galvanized) steel sheet, 0.052 inch thick.

1. Finish: Two-coat fluoropolymer.
2. Color: As indicated by manufacturer's designations.

E. Construction:

1. Curb Profile: Manufacturer's standard compatible with roofing system.
2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
3. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
4. Top Surface: Level top of curb, with roof slope accommodated by sloping deck-mounting flange.
5. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
6. Insulation: Factory insulated with 1-1/2-inch- thick glass-fiber board insulation.
7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
8. Nailer: Factory-installed wood nailer , continuous around curb perimeter.
9. Wind Restraint Straps and Base Flange Attachment: Provide wind restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to meet wind uplift requirements.
10. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch- thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
11. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.
12. Damper Tray: Provide damper tray or shelf with opening .

2.3 ROOF HATCHES

A. Roof Hatches: Metal roof-hatch units with lids and insulated single-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. BILCO Company (The).

B. Type and Size: Single-leaf lid, 36 by 36 inches.

C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.

D. Hatch Material: Aluminum sheet.

1. Thickness: Manufacturer's standard thickness for hatch size indicated.
2. Finish: Two-coat fluoropolymer.
3. Color: As selected by Architect from manufacturer's full range.

E. Construction:

1. Insulation: 2-inch- thick, polyisocyanurate board.

a. R-Value: 12.0 according to ASTM C1363.

2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
6. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
7. Sloping Roofs: Where slope or roof deck exceeds 1:48, fabricate curb with perimeter curb height that is tapered to accommodate roof slope so that top surfaces of perimeter curb are level. Equip hatch with water diverter or cricket on side that obstructs water flow.

F. Hardware: Spring operators, hold-open arm, stainless steel spring latch with turn handles, stainless steel butt- or pintle-type hinge system, and padlock hasps inside and outside.

1. Provide two-point latch on lids larger than 84 inches.
2. Provide remote-control operation.

G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

1. Height: 42 inches above finished roof deck.
2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
8. Fabricate joints exposed to weather to be watertight.
9. Fasteners: Manufacturer's standard, finished to match railing system.
10. Finish: Manufacturer's standard.

    a. Color: As selected by Architect from manufacturer's full range.

H. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.

1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches above finished roof deck.
3. Material: Steel tube.
4. Post: 1-5/8-inch- diameter pipe.
5. Finish: Manufacturer's standard baked enamel or powder coat.

    a. Color: As indicated by manufacturer's designations.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Roof Curb Installation: Install each roof curb so top surface is level.

C. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

D. Roof-Hatch Installation:

1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.

2. Attach safety railing system to roof-hatch curb.
3. Attach ladder-assist post according to manufacturer's written instructions.

E. Seal joints with elastomeric sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 09 91 13 "Exterior Painting."

B. Clean exposed surfaces according to manufacturer's written instructions.

C. Clean off excess sealants.

D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

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SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Requirements:

1. Section 07 84 43 "Joint Firestopping" for joints in or between fire-resistance-rated construction, and in smoke barriers.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Hilti, Inc.

B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.

E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.

F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

1. Substrate primers.
2. Collars.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.

C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 07 84 13

SECTION 07 84 43 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.
2. Joints at exterior curtain-wall/floor intersections.

B. Related Requirements:

1. Section 07 84 13 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers and for wall identification.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure joint firestopping systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of joints to ensure that joint firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform joint firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test per testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:

a. Joint firestopping systems shall bear classification marking of a qualified testing agency.

1) UL in its "Fire Resistance Directory."
2) Intertek Group in its "Directory of Listed Building Products."
3) .

2.2 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E 1966 or UL 2079.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Hilti, Inc..

2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.

C. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined per ASTM E 2307.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Hilti, Inc..

2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint systems, clean joints immediately to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Prime substrates where recommended in writing by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

C. Install elastomeric fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Joint Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.

5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.

B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.

C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Listed Building Products" under product category Expansion/Seismic Joints or Firestop Systems.

C. Floor-to-Floor, Joint Firestopping Systems:

1. UL-Classified Systems: FF-D S- .
2. Assembly Rating: As indicated.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I Class II Class III - percent compression or extension.
5. L-Rating at Ambient: Less than Insert cfm/ft. (cu. m/s x m).
6. L-Rating at 400 Deg F: Less than Insert cfm/ft. (cu. m/s x m).
7. W-Rating: No leakage of water at completion of water leakage testing.

D. Wall-to-Wall, Joint Firestopping Systems:

1. UL-Classified Systems: WW-D S- .
2. Assembly Rating: As indicated.

3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I Class II Class III - percent compression or extension.
5. L-Rating at Ambient: Less than Insert cfm/ft. (cu. m/s x m).
6. L-Rating at 400 Deg F: Less than Insert cfm/ft. (cu. m/s x m).

E. Floor-to-Wall, Joint Firestopping Systems:

1. UL-Classified Systems: FW-D S- .
2. Assembly Rating: As indicated.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I Class II Class III - percent compression or extension.
5. L-Rating at Ambient: Less than Insert cfm/ft. (cu. m/s x m).
6. L-Rating at 400 Deg F: Less than Insert cfm/ft. (cu. m/s x m).

F. Head-of-Wall, Fire-Resistive Joint Firestopping Systems:

1. UL-Classified Systems: HW-D S- .
2. Intertek Group-Listed Systems: .
3. Assembly Rating: As indicated.
4. Nominal Joint Width: As indicated.
5. Movement Capabilities: Class I Class II Class III - percent compression or extension.
6. L-Rating at Ambient: Less than Insert cfm/ft. (cu. m/s x m).
7. L-Rating at 400 Deg F: Less than Insert cfm/ft. (cu. m/s x m).

G. Bottom-of-Wall, Joint Firestopping Systems:

1. UL-Classified Systems: BW-D S- .
2. Assembly Rating: As indicated.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I Class II Class III - percent compression or extension.
5. L-Rating at Ambient: Less than Insert cfm/ft. (cu. m/s x m).
6. L-Rating at 400 Deg F: Less than Insert cfm/ft. (cu. m/s x m).

H. Wall-to-Wall, Joint Firestopping Systems Intended for Use as Corner Guards:

1. UL-Classified Systems: CG-D S- .
2. Assembly Rating: As indicated.
3. Nominal Joint Width: As indicated.
4. Movement Capabilities: Class I Class II Class III - percent compression or extension.
5. L-Rating at Ambient: Less than Insert cfm/ft. (cu. m/s x m).
6. L-Rating at 400 Deg F: Less than Insert cfm/ft. (cu. m/s x m).

I. Perimeter Joint Firestopping Systems:

1. UL-Classified Perimeter Fire-Containment Systems: CW-D S-.
2. Intertek Group-Listed, Perimeter Fire-Barrier Systems: .
3. Integrity Rating: As indicated.

4. Insulation Rating: As indicated.
5. Linear Opening Width: As indicated, maximum.
6. Movement Capabilities: Class I Class II Class III - percent compression or extension.
7. F-Rating: As indicated.

END OF SECTION 07 84 43

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SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Immersible joint sealants.
5. Silyl-terminated polyether joint sealants.
6. Mildew-resistant joint sealants.
7. Polysulfide joint sealants.
8. Butyl joint sealants.
9. Latex joint sealants.

B. Related Requirements:

1. Section 07 91 00 "Preformed Joint Seals" for preformed compressible foam and precured joint seals.
2. Section 07 92 19 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.
3. Section 32 13 73 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [Project site] <Insert location>.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by [manufacturer and witnessed by a qualified testing agency] [a qualified testing agency].

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion-Test Reports: For each sealant application tested.

G. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with [stone] [masonry] <Insert substrate> substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.8 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: [Five] <Insert number> years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. GE Construction Sealants; SCS2700 SilPruf LM .
b. Sika Corporation U.S.; Sikasil WS-290 Sikasil WS-290 FPS.
c. Insert manufacturer's name; product name or designation.

B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 791.
b. GE Construction Sealants; Momentive Performance Materials Inc; SCS2000 SilPruf.
c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 265 LTS.

d. Pecora Corporation; PCS.
e. Sika Corporation U.S.; Sikasil WS-295 Sikasil WS-295 FPS.

C. Silicone, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability. nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. GE Construction Sealants; Momentive Performance Materials Inc; SWS.

D. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 758.
b. GE Construction Sealants; Momentive Performance Materials Inc; SCS2350.
c. Polymeric Systems, Inc.; PSI-631 PSI-641.
d. Schnee-Morehead, Inc., an ITW company; SM5731 Poly-Glaze Plus.
e. Sherwin-Williams Company (The); White Lighning Silicone Ultra All Purpose Sealant.

E. Silicone, Acid Curing, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant: ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik, Inc.; Chem-Calk 1200.
b. Dow Corning Corporation; [999A].
c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 100 GC Bondaflex Sil 100 GP Bondaflex Sil 100 HT.
d. Pecora Corporation; 860.
e. Polymeric Systems, Inc.; PSI-601.
f. Sika Corporation U.S.; Sikasil-GP.

F. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dow Corning Corporation; NS.
    b. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; [Bondaflex Sil 728 NS].

G. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dow Corning Corporation; 799 CCS.
    b. Soudal USA; RTV 50.

H. Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 199 PG Bondaflex Sil 200 GPN Bondaflex Sil 201 FC Bondaflex Sil 211 FC.
    b. Sika Corporation U.S.; Sikasil-N Plus US.

I. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 100/50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 728 SG Bondaflex Sil 728 SL.

J. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 200 SC Bondaflex Sil 200 MJS.

K. Silicone, M, P, 100/50, T, NT: Multicomponent, pourable, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type M, Grade P, Class 100/50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 728 RCS.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 290 FPS-NB Bondaflex Sil 290 NB.
b. Pecora Corporation; 890FTS/TXTR 890 NST.
c. Tremco Incorporated; Spectrem

C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 756 SMS 795.
b. GE Construction Sealants; Momentive Performance Materials Inc; SilPruf NB.
c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 295 FPS NB.
d. Pecora Corporation; 864NST 895NST 898NST.
e. Tremco Incorporated; Spectrem

D. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dow Corning Corporation; 790.

E. Silicone, Nonstaining, M, NS, 50, NT: Nonstaining, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Tremco Incorporated; Spectrem 4-TS.

2.4 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Construction Chemicals - Building Systems; Sonalastic TX1.
    b. Bostik, Inc.; Chem-Calk GPS1 900 915 916 2000.
    c. ER Systems, an ITW Company; Pacific Polymers Elasto-Thane 230 MP.
    d. Pecora Corporation; Dynatrol I-XL.
    e. Polymeric Systems, Inc.; Flexiprene 1000.
    f. Schnee-Morehead, Inc., an ITW company; Permathane SM7108.
    g. Sherwin-Williams Company (The); [Stampede-1] [Stampede-TX].
    h. Sika Corporation U.S.; Sikaflex Textured Sealant.
    i. Tremco Incorporated; Dymonic.

B. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Sika Corporation U.S.; Sikaflex 15LM.

C. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. LymTal International, Inc.; Iso-Flex 330 Iso-Flex 875R.

D. Urethane, S, P, 35, T, NT: Single-component, pourable, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 35, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Bostik, Inc.; Chem-Calk 955-SL.

E. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Construction Chemicals - Building Systems; Sonolastic SL 1.
    b. Pecora Corporation; NR-201.
    c. Polymeric Systems, Inc.; Flexiprene 952.
    d. Schnee-Morehead, Inc.; an ITW company; Permathane SM7101.
    e. Sherwin-Williams Company (The); Stampede 1SL.

F. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Pecora Corporation; Dynatrol II.

G. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Sherwin-Williams Company (The); Stampede-2NS.

H. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Tremco Incorporated; Dymeric 240.

I. Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik, Inc.; Chem-Calk 505.
b. LymTal International, Inc.; Iso-Flex 881 Iso-Flex 885 SG.
c. Sika Corporation U.S.; Sikaflex - 2c NS EZ Mix.

J. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. LymTal International, Inc.; Iso-Flex 888QC.

K. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik, Inc.; Chem-Calk 555-SL.
b. LymTal International, Inc.; Iso-Flex 880 GB.
c. Pecora Corporation; Dynatrol II SG Urexpan NR 200
d. Sherwin-Williams Company (The); Stampede-2SL.
e. Tremco Incorporated; THC 900/901.

2.5 IMMERSIBLE JOINT SEALANTS

A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C 1247, [Class 1] [Class 2]; tested in deionized water unless otherwise indicated

B. Urethane, Immersible, S, NS, 100/50, NT, I: Immersible, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Uses NT, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Tremco Incorporated; Vulkem 921.

C. Urethane, Immersible, S, NS, 35, NT, I: Immersible, single-component, nonsag, plus 35 percent and minus 35 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Construction Chemicals - Building Systems; Sonolastic NP 1.

D. Urethane, Immersible, S, NS, 50, T, NT, I: Immersible, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Tremco Incorporated; Dymonic 100.

E. Urethane, Immersible, S, NS, 35, T, NT, I: Immersible, single-component, nonsag, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Sika Corporation U.S.; Sikaflex

F. Urethane, Immersible, S, NS, 25, T, NT, I: Immersible, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Tremco Incorporated; Vulkem 116.

G. Urethane, Immersible, S, P, 50, T, NT, I: Immersible, single-component, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 50, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Tremco Incorporated; Vulkem 45 SSL.

H. Urethane, Immersible, S, P, 25, T, NT, I: Immersible, single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Sika Corporation U.S.; Sikaflex 1c SL.
b. Tremco Incorporated; Vulkem 45.
c. W.R. Meadows, Inc; Pourthane SL.

I. Polysulfide, Immersible, M, NS, 25, NT, I: Immersible, multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, polysulfide joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses NT and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Polymeric Systems, Inc.; PSI-275.

J. Urethane, Immersible, M, NS, 50, T, NT, I: Immersible, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 50, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. LymTal International, Inc.; Iso-Flex 881R.
b. Tremco Incorporated; Dymeric 240 FC.

K. Urethane, Immersible, M, NS, 25, T, NT, I: Immersible, multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; Dynatred.

b. Sika Corporation U.S.; Sikaflex 2c NS.

L. Polysulfide, Immersible, M, NS, 25, T, NT, I: Immersible, multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, polysulfide joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; Synthacalk GC-2+.

M. Urethane, Immersible, M, P, 25, T, NT, I: Immersible, multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Construction Chemicals - Building Systems; Sonolastic SL 2.
b. LymTal International, Inc.; Iso-Flex 880 GB.
c. Sika Corporation U.S.; Sikaflex 2c SL.

2.6 SILYL-TERMINATED POLYETHER (STPE) JOINT SEALANTS

A. STPE, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. GE Construction Sealants; Momentive Performance Materials Inc; SCS7000.
b. Pecora Corporation; DynaTrol I-XL Tru-White.
c. Sherwin-Williams Company (The); Stampede 100.

B. STPE, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Tremco Incorporated; Dymonic FC.

C. STPE, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex STP 25.
b. Polymeric Systems, Inc.; Sil-Thane 803.
c. Schnee-Morehead, Inc., an ITW company; SM2100.

D. STPE, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 100, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Soudal USA; SoudaSeal 150LM.

E. STPE, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Soudal USA; SoudaSeal 50LM.

F. STPE, S, NS, 35, T, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 35, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Soudal USA; SoudaSeal AP.

G. STPE, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Soudal USA; SoudaSeal CL SoudaSeal FC.

H. STPE, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Soudal USA; SoudaSeal SL.

2.7 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 786-M White.
b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 100 WF.
d. Soudal USA; RTV GP.
e. Tremco Incorporated; Tremsil 200.

C. STPE, Mildew Resistant, S, NS, 50, NT: Mildew-resistant, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Construction Chemicals - Building Systems; Sonolastic 150.

2.8 POLYSULFIDE JOINT SEALANTS

A. Polysulfide, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, polysulfide joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide the favailable products that may be incorporated into the Work include, but are not limited to, the following:

a. W.R. Meadows, Inc.; Deck-O-Seal One Step.

B. Polysulfide, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, polysulfide joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. W.R. Meadows, Inc.; Deck-O-Seal Gun Grade.

C. Polysulfide, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, polysulfide joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. W.R. Meadows, Inc.; Deck-O-Seal 125 Deck-O-Seal 150.

2.9 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik, Inc.; Chem-Calk 300.
b. Pecora Corporation; BC-158.

2.10 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Construction Chemicals - Building Systems; Sonolac.
b. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex 600 Bondaflex Sil-A 700.
c. Pecora Corporation; AC-20.
d. Sherwin-Williams Company (The); 850A 950A PowerHouse.
e. Tremco Incorporated; Tremflex 834.

2.11 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Construction Chemicals - Building Systems.
b. Construction Foam Products, a division of Nomaco, Inc.

B. Cylindrical Sealant Backings: ASTM C 1330, [Type C (closed-cell material with a surface skin)] [Type O (open-cell material)] [Type B (bicellular material with a surface skin)] [or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated], and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.12 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.
    e. <Insert other porous joint substrate>.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.
    e. <Insert other nonporous joint substrate>.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at according to Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at according to Figure 8C in ASTM C 1193.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.

b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Control and expansion joints in brick pavers.
b. Isolation and contraction joints in cast-in-place concrete slabs.
c. Joints between plant-precast architectural concrete paving units.
d. Joints in stone paving units, including steps.
e. Tile control and expansion joints.
f. Joints between different materials listed above.
g. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, M, P, 50, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.

1. Joint Locations:

a. Joints in pedestrian plazas.
b. Joints in swimming pool decks.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, immersible, S, P, 25, T, NT, I.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Construction joints in cast-in-place concrete.
b. Joints between plant-precast architectural concrete units.
c. Control and expansion joints in unit masonry.
d. Joints in dimension stone cladding.

e. Joints in glass unit masonry assemblies.
f. Joints in exterior insulation and finish systems.
g. Joints between metal panels.
h. Joints between different materials listed above.
i. Perimeter joints between materials listed above and frames of doors, windows and louvers.
j. Control and expansion joints in ceilings and other overhead surfaces.
k. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in stone flooring.
c. Control and expansion joints in brick flooring.
d. Control and expansion joints in tile flooring.
e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, P, 25, T, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Tile control and expansion joints.
c. Vertical joints on exposed surfaces of unit masonry, concrete walls and partitions.
d. Joints on underside of plant-precast structural concrete beams and planks.
e. Other joints as indicated on Drawings.

2. Joint Sealant: Urethane, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:

a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.

c. Other joints as indicated on Drawings.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

H. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:

a. Aluminum thresholds.
b. Sill plates.
c. Other joints as indicated on Drawings.

2. Joint Sealant: Butyl-rubber based.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior standard steel doors and frames.

B. Related Requirements:

1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.2 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings,temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.

B. Field quality control reports.

1.7 QUALITY ASSURANCE

A. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies shall meet the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ceco Door; ASSA ABLOY.
2. Curries Company; ASSA ABLOY.
3. LaForce, Inc.
4. Steelcraft; an Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
3. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. .

1. Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches.
c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch.
d. Edge Construction: Model 1, Full Flush.
e. Edge Bevel: Provide manufacturer's standard beveled or square edges.
f. Core: Manufacturer's standard.
g. Fire-Rated Core: Manufacturer's standard core for fire-rated and temperature-rise-rated doors.

2. Frames:

a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Face welded.

3. Exposed Finish: Prime.

2.4 BORROWED LITES

A. Fabricate of uncoated steel sheet, minimum thickness of 0.053 inch.

B. Construction: Face welded.

C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.

D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.

C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.

E. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

F. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

G. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.7 FABRICATION

A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.

1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with square stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces. Touch up factory-applied finishes where spreaders are removed.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.

B. Hollow-Metal Frames: Comply with ANSI/SDI A250.11.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.

    a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
    b. Install frames with removable stops located on secure side of opening.

2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
3. Floor Anchors: Secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

4. Solidly pack mineral-fiber insulation inside frames.
5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
3. Smoke-Control Doors: Install doors in accordance with NFPA 105.

D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 REPAIR

A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

B. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

SECTION 08 14 00 – FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 SUMMARY:

A. Extent and location of each type of flush wood door is indicated on drawings and in schedules.

B. Types of doors required include the following:

1. Solid core flush wood doors with wood veneer faces.

C. Factory-prefitting to frames and factory-premachining for hardware for wood doors is included in this section.

D. Metal door frames for flush wood doors are specified in Section 08 11 00 – Standard Steel Doors and Frames.

E. Glazing for flush wood doors is specified in Section 08 80 00 – Glass and Glazing.

1.3 SUBMITTALS:

A. Product Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, and trim for openings and louvers.

B. Shop Drawings: Submit six (6) copies of shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.

C. For factory-premachined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.

1.4 QUALITY ASSURANCE:

A. Quality Standards: Comply with the following standards:

1. NWWDA Quality Standard: I.S.1 "Industry Standard for Wood Flush Doors", of National Wood Window and Door Association (NWWDA).

2. AWI Quality Standard: "Architectural Woodwork Quality Standards", including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.

B. NWWDA Quality Marking: Mark each wood door with NWWDA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of NWWDA I.S. 1 Series.

C. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152 and which are labeled and listed for ratings indicated by UL, Warnock Hersey or other testing and inspection agency acceptable to authorities having jurisdiction.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions.

B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.6 PROJECT CONDITIONS:

A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location:

1. Referenced AWI quality standard including Section 100-S-11 "Relative Humidity and Moisture Content".

1.6 WARRANTY:

A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.

1. Warranty shall include refinishing and reinstallation which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.

2. Warranty shall include all doors in which the combined height of two or more light and/or louver cut-outs exceeds 1/2 the door height, provided no single such cut-out exceeds 1/2 the door height.

3. Warranty shall be in effect during following period of time after date of Substantial Completion.

    a. Solid Core Interior Doors:

        1. Life of installation.

C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 – PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors which may be incorporated in the work include, but are not limited to, the following:

    1. Solid Core Doors with Wood Veneer Faces:

        a. Algoma Hardwoods, Inc.
        b. Graham Manufacturing Corp.
        c. VT Industries

2.2 INTERIOR FLUSH WOOD DOORS:

A. Solid Core Doors for transparent finish custom stained to match Architects sample: Comply with the following requirements:

    1. Faces: Grade "A", species as indicated on drawings.

    2. AWI Grade: Premium

    3. Construction: PC-5 or PC-7 (particleboard core, 5- or 7-ply)

    4. Edge Construction: Stiles and rails shall be securely bonded to core. Vertical edges shall be same species as face. No finger joints shall be permitted on lock edge. Provide additional blocking at top rail to eliminate through bolting of closures.

B. Fire-Rated Solid Core Doors: Comply with the following requirements:

    1. Faces and AWI Grade: Provide faces and grade to match non-rated doors in same area of building, unless otherwise indicated.

    2. Construction: As required to provide fire-resistance rating indicated.

    3. Edge Construction: Stiles and rails shall be securely bonded to core. Vertical edges shall be same species as face. No finger joints shall be permitted on lock edge. Provide wood lock blocks and additional blocking at top rail to eliminate through bolting of closures.

4. Pairs: Furnish formed steel edges and astragals for pairs of fire-rated doors, unless otherwise indicated.

2.3 LOUVERS AND LIGHT FRAMES:

A. Metal Louvers: Size, type and profile shown and fabricated from the following:

1. Provide Model "GO" type grille with a "V" style sight tight fin as manufactured by Barb-Aire, Inc., Huntsville, AL or approved equal in function and appearance. See door schedule and HVAC drawings for size and locations.

B. Wood Beads for Light Openings in Fire Doors: Manufacturer's standard fire-rated wood-veneer beads matching veneer species of door faces.

2.4 FABRICATION:

A. Fabricate flush wood doors to produce doors complying with following requirements:

1. Factory-prefit and premachine doors to fit frame opening sizes indicated with the following uniform clearances and bevels:

a. Comply with tolerance requirements of AWI for prefitting. Comply with final hardware schedules and door frame shop drawings and with hardware templates. Unless noted otherwise, provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

2. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.

3. Bevel non-rated doors 1/8" in 2" at lock and hinge edges.

4. Bevel fire-rated doors 1/8" in 2" in lock edge; trim stiles and rails only to extent permitted by labeling agency.

5. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory premachining.

B. Metal Astragals: Premachine astragals and formed steel edges for hardware where required for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.

D. Light Openings: Factory cut openings. Trim openings with solid wood bead moldings matching veneer species of door faces.

E. Metal Louvers: Factory cut openings and provide solid wood bead moldings for prepared openings.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine installed door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.

2. Reject doors with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:

A. Hardware: For installation see Division 8 "Finish Hardware" section of these specifications.

B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and of referenced AWI standards and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.

C. Prefit Doors: Fit to frames for uniform clearance at each edge.

3.3 FINISHING:

A. Finish wood doors at factory. Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.

B. Finish: Custom stained to match architect's sample.

3.4 ADJUSTING AND PROTECTION:

A. Operation: Rehang or replace doors which do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 08 14 00

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SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each type of access door and frame and for each finish specified.

C. Product Schedule: For access doors and frames.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

2.2 FIRE-RATED ACCESS DOORS AND FRAMES

A. Fire-Rated, Flush Access Doors with Concealed Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Babcock-Davis.
    b. JL Industries, Inc.; a division of the Activar Construction Products Group.
    c. Karp Associates, Inc.
    d. Nystrom, Inc.

2. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with concealed flange for gypsum board installation, self-closing door, and concealed hinge. Size as indicated on drawings.
3. Locations: Ceiling Location as indicated on Drawings.

4. Fire-Resistance Rating: Not less than that of adjacent construction, but minimum of1 hour.
5. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch, 20 gage, factory primed.
6. Frame Material: Same material, thickness, and finish as door.
7. Latch and Lock: Self-closing, self-latching door hardware, operated by knurled-knob or operated by key, with interior release.

2.3 MATERIALS

A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

B. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304. Remove tool and die marks and stretch lines, or blend into finish.

C. Frame Anchors: Same material as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

D. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.

2.5 FINISHES

A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Adjust doors and hardware, after installation, for proper operation.

C. Provide stops/blocking so that insulation does not interfere with door function.

END OF SECTION 08 31 13

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SECTION 08 36 00 – SECTIONAL OVERHEAD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Glazed Aluminum Sectional Overhead Doors

B. Electric Operators and Controls.

C. Operating Hardware, tracks, and support.

1.2 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Prepared opening in masonry. Execution requirements for placement of anchors in masonry wall construction.

B. Section 05 50 00 - Metal Fabrications: Steel frame and supports.

C. Section 06 10 00 – Rough Carpentry: Rough wood framing and blocking for door opening.

D. Section 07 90 00 - Joint Sealants: Perimeter sealant and backup materials.

E. Section 09 91 23 – Interior Painting: Field painting.

F. Section 16 13 00 - Raceway and Boxes: Empty conduit from control station to door operator.

G. Section 16 15 00 - Wiring Connections: Electrical service to door operator.

1.3 REFERENCES

A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

1.7 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com.

B. Substitutions: Permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 GLAZED ALUMINUM SECTIONAL OVERHEAD DOORS

A. Glazed Sectional Overhead Doors: 521 Series Aluminum Doors by Overhead Door Corporation.

1. Door Assembly: Stile and rail assembly secured with 1/4 inch (6 mm) diameter through rods.
   a. Panel Thickness: 1-3/4 inches (44 mm).
   b. Center Stile Width: 2-11/16 inches (68 mm)
   c. End Stile Width: 3-5/16 inches (84 mm)
   d. Intermediate Rail Pair Width: 3-11/16 inches (94 mm).
   e. Top Rail Width:
      1) 3-3/4 inches (95 mm).
   f. Bottom Rail Width:
      1) 3-3/4 inches (95 mm).
   g. Aluminum Panels: 0.050 inch (1.3 mm) thick, aluminum.
   h. Stiles and Rails: 6063 - T6 aluminum.
   i. Springs:
      1) 10,000 cycles.
   j. Glazing:
      1) 1/8 inch (3 mm) Tempered glass, bottom pane: satin etched.
2. Finish and Color:
   a. Powder Coating Finish: Color as selected by Architect from manufacturer's standard colors.
3. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
4. Lock: Interior galvanized single unit.
5. Weatherstripping:
   a. Flexible bulb-type strip at bottom section.
   b. Flexible Jamb seals.
   c. Flexible Header seal.
6. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
7. Manual Operation: Chain hoist.
8. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
   a. Entrapment Protection: Required for momentary contact, includes radio control operation.

1) Electric sensing edge monitored to meet UL 325/2010.

b. Operator Controls:

1) Key operated control stations with open, close, and stop buttons.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer’s printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.4 CLEANING AND ADJUSTING

A. Adjust door assembly to smooth operation and in full contact with weatherstripping.

B. Clean doors, frames and glass.

C. Remove temporary labels and visible markings.

3.5 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION 08 36 00

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SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed storefront systems.
2. Aluminum-framed entrance door systems.

1.2 ALLOWANCES

A. Field quality control is part of testing and inspecting allowance.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
4. Include point-to-point wiring diagrams showing the following:

    a. Power requirements for each electrically operated door hardware.
    b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

E. Delegated Design Submittal: For aluminum-framed entrances and storefronts including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.

B. Quality-Control Program: Developed specifically for Project, including fabrication and installation, in accordance with recommendations in ASTM C1401. Include periodic quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer and that employs a qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors and that employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.8 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including, but not limited to, excessive deflection.
b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

    a. Thermal stresses transferring to building structure.
    b. Glass breakage.
    c. Noise or vibration created by wind and thermal and structural movements.
    d. Loosening or weakening of fasteners, attachments, and other components.
    e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

    a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

3. Cantilever Deflection: Limited to 2L/175 at unsupported cantilevers.

E. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft..

G. Water Penetration under Dynamic Pressure: Test in accordance with AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft..
2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

H. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested in accordance with AAMA 501.6 at design displacement and 1.5 times the design displacement.

I. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.35 Btu/sq.ft. x h x deg F as determined in accordance with NFRC 100.
b. Entrance Doors: U-factor of not more than 0.53 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.

2. Solar Heat-Gain Coefficient (SHGC):

a. Fixed Glazing and Framing Areas: SHGC for the system of not more than 0.26 as determined in accordance with NFRC 200.
b. Entrance Doors: SHGC of not more than 0.22 as determined in accordance with NFRC 200.

3. Air Leakage:

a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft. when tested in accordance with ASTM E283.
b. Entrance Doors: Air leakage of not more than 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

4. Condensation Resistance Factor (CRF):

a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined in accordance with AAMA 1503.
b. Entrance Doors: CRF of not less than 57 as determined in accordance with AAMA 1503.

J. Noise Reduction: Test in accordance with ASTM E90, with ratings determined by ASTM E1332, as follows.

1. Outdoor-Indoor Transmission Class: Minimum 30.

K. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 1 for basic protection.

1. Large-Missile Test: For glazing located within 30 feet of grade.

L. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested in accordance with AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
b. Low Exterior Ambient-Air Temperature: 0 deg F.
c. Interior Ambient-Air Temperature: 75 deg F.

2.3 STOREFRONT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Kawneer North America, an Arconic company.

B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken.
2. Interior Vestibule Framing Construction: Nonthermal.
3. Glazing System: Retained mechanically with gaskets on four sides.
4. Glazing Plane: Center.
5. Finish: As indicated on drawings.
6. Fabrication Method: Field-fabricated stick system.
7. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
8. Steel Reinforcement: As required by manufacturer.

C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

2.4 ENTRANCE DOOR SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Kawneer North America, an Arconic company.

B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 2- to 2-1/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: Wide stile; 5-inch nominal width.
3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

4. Finish: Match adjacent storefront framing finish.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 71 00 "Door Hardware."

2.6 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."

2.7 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

F. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

G. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.8 ACCESSORIES

A. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from [exterior][interior][interior for vision glass and exterior for spandrel glazing or metal panels].
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior and exterior doors, provide compression weather stripping at fixed stops.

F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.10 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 92 00 "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

3.3 INSTALLATION OF GLAZING

A. Install glazing as specified in Section 08 80 00 "Glazing."

3.4 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE DOORS

A. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.5 ERECTION TOLERANCES

A. Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on [representative areas of aluminum-framed entrances and storefronts][mockups]<Insert requirements>.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested in accordance with AAMA 501.2 and shall not evidence water penetration.

a. Perform a minimum of two tests in areas as directed by Architect.

2. Air Leakage: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..

    a. Perform a minimum of two tests in areas as directed by Architect.
    b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to [10, 35, and 70 percent completion]<Insert requirements>.

3. Water Penetration: ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.

C. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

3.7 MAINTENANCE SERVICE

A. Entrance Door Hardware Maintenance:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

END OF SECTION 08 41 13

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.
h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.

Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Seven years for heavy duty cylindrical (bored) locks and latches.

3. Five years for exit hardware.
4. Twenty five years for manual overhead door closer bodies.
5. Five years for motorized electric latch retraction exit devices.
6. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

    a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
    b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

    a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

    a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

    a. Bommer Industries (BO).
    b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
    c. Stanley Hardware (ST).
    d. No Substitution.

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:

    a. Bommer Industries (BO).
    b. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
    c. No Substitution.

2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) - EL-CEPT Series.
b. Securitron (SU) - EL-CEPT Series.
c. Stanley Hardware (ST) EPT-12C Series.
d. No Substitution.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC-C Series.
b. Stanley Hardware (ST) - WH Series.
c. No Substitution.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

a. Door Controls International (DC).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Trimco (TC).
d. No Substitution.

B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

a. Door Controls International (DC).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Trimco (TC).
d. No Substitution.

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers:

a. Hiawatha, Inc. (HI).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Trimco (TC).
d. No Substitution.

D. Flat Latch Locking Pulls: Post-mount style door pulls with integrated flat latch locking system in type and design as specified in the Hardware Sets. Full and half height with latching at top of door. Option for horizontal push bar. Mechanical or electric strike release as specified. Dogging and ADA thumbturn included. Customized sizing and configuration options.

1. Manufacturers:

a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO) - FL Series.
b. No Substitution.

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer’s Standard.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).
d. No Substitution.

2.7 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Where specified, provide status indicators with highly reflective color and wording for “locked/unlocked” or “vacant/occupied” with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1” x 0.6” with a curved design allowing a 180 degree viewing angle with protective covering to prevent tampering.

2. Manufacturers:

   a. Corbin Russwin Hardware (RU) - ML2000 Series.
   b. dormakaba Best (BE) - 45H Series.
   c. Sargent Manufacturing (SA) - 8200 Series.

2.8 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.9 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes tested to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and

latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

   a. HES (HS) - 1500/1600 Series.
   b. No Substitution.

B. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes tested to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.

1. Manufacturers:

   a. HES (HS) - 9400/9500/9600/9700/9800 Series.
   b. No Substitution.

C. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

9. Rail Sizing: Provide exit device rails factory sized for proper door width application.

10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

    1. Manufacturers:

        a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
        b. Detex (DE) - Advantex.
        c. Sargent Manufacturing (SA) - 80 Series.

2.11 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.

    1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

    2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.

    3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.

4. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED5000 Series.
    b. Sargent Manufacturing (SA) - 80 Series.

2.12 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - DC6000 Series.
    b. Norton Door Controls (NO) - 7500 Series.
    c. Sargent Manufacturing (SA) - 351 Series.

2.13 ELECTROHYDRAULIC DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Norton Door Controls (NO) - 6000 Series.
2. Stanley Security Solutions (ST) - D-4990 Series.
3. No Substitution.

2.14 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:

   a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

   a. Hiawatha, Inc. (HI).
   b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   c. Trimco (TC).
   d. No Substitution.

2.15 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

   a. Hiawatha, Inc. (HI).
   b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
   c. Trimco (TC).
   d. No Substitution.

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Rixson Door Controls (RF).
b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
c. Sargent Manufacturing (SA).
d. No Substitution.

2.16 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
3. Reese Enterprises, Inc. (RE).
4. No Substitution.

2.17 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Securitron (SU) - DPS Series.
b. No Substitution.

B. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

2. Manufacturers:

a. Securitron (SU) - AQL Series.
b. No Substitution.

2.18 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.19 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9

Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
2. Submit documentation of incomplete items in the following formats:

    a. PDF electronic file.
    b. Electronic formatted file integrated with the Openings Studio™ door opening management software platform.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. SA - SARGENT
5. HS - HES
6. RF - Rixson
7. NO - Norton
8. HD - HID
9. OT - Other
10. SU - Securitron

Hardware Sets

Set: 1.0

1	Continuous Hinge x EPT (AL)	CFM SLF/I-HD1 PT x Dr Ht		PE
1	Rim Exit (narrow, nightlatch, ELR, RX)	19 43 55 56 AD8504 Less Pull	US32D	SA
1	Offset Pull (Grip Zone)	RM3411-72 x 12XHD MP	US32	RO
1	Surf Overhead Stop	9-X36	630	RF
1	Automatic Operator	6011 / 6061 (as req'd)	689	NO

1	Threshold - 5" T-Break	252x3AFG	PE
1	Sweep	315CN	PE
1	E-Lynx Harness (Frame)	QC-C3000P	MK
1	E-Lynx Harness (Door)	QC-C*** (length / type as req'd)	MK
1	Wiring Diagram	Elevation & Point to Point	OT
2	Actuator Button	505	NO
1	Door Position Switch	DPS-M / W-GY (as req'd)	SU
1	Power Supply	AQL4-R8E1	SU
1	Electric Power Transfer	EL-CEPT	SU

Notes: WIDE STILE EXIT DEVICES ACCEPTABLE AT WIDE STILE DOORS
-Weatherstripping/Door edge gasketing furnished by Aluminum Door/Frame supplier.
-Furnish all necessary brackets/spacers and plates necessary for a complete and proper installation of hardware items listed.

Door normally closed and locked.
Valid card read retracts latch for entry. Key override available.
Door can be unlocked on a time schedule set in EAC system, to act as push/pull.
When door is unlocked, either actuator button opens door automatically.
When door is locked, inside actuator button retracts latch and opens door automatically.
Door position switch indicates door status.
REX switch in push bar signals authorized egress.
Free egress at all times.

Set: 2.0

1	Continuous Hinge x EPT (AL)	CFM SLF/I-HD1 PT x Dr Ht		PE
1	Rim Exit (narrow, exit only, ELR, RX)	19 43 55 56 AD8510 EO	US32D	SA
1	Offset Pull (Grip Zone)	RM3411-72 x 12XHD MP	US32	RO
1	Surf Overhead Stop	9-X36	630	RF
1	Closer - Top Jamb	J7500	689	NO
1	Threshold - 5" T-Break	252x3AFG		PE
1	Sweep	315CN		PE
1	E-Lynx Harness (Frame)	QC-C3000P		MK
1	E-Lynx Harness (Door)	QC-C*** (length / type as req'd)		MK
1	Wiring Diagram	Elevation & Point to Point		OT
1	Door Position Switch	DPS-M / W-GY (as req'd)		SU
1	Power Supply	AQL4-R8E1		SU
1	Electric Power Transfer	EL-CEPT		SU

Notes: WIDE STILE EXIT DEVICES ACCEPTABLE AT WIDE STILE DOORS
-Weatherstripping/Door edge gasketing furnished by Aluminum Door/Frame supplier.
-Furnish all necessary brackets/spacers and plates necessary for a complete and proper installation of hardware items listed.

Door normally closed and locked.
Door can be unlocked on a time schedule set in EAC system, to act as push/pull.
Door position switch indicates door status.

REX switch in push bar signals authorized egress.
Free egress at all times.

Set: 3.0

1	Continuous Hinge (AL)	CFM SLF/I-HD1 x Dr Ht		PE
1	Rim Exit (narrow, nightlatch)	19 43 AD8504 Less Pull	US32D	SA
1	Electric Strike	9600	630	HS
1	Offset Pull (Grip Zone)	RM3411-72 x 12XHD MP	US32	RO
1	Surf Overhead Stop	9-X36	630	RF
1	Closer - Top Jamb	J7500	689	NO
1	Threshold - 5" T-Break	252x3AFG		PE
1	Sweep	315CN		PE
1	E-Lynx Harness (Frame)	QC-C3000P		MK
1	Card Reader	By Security Vendor	BLK	HD
1	Wiring Diagram	Elevation & Point to Point		OT
1	Door Position Switch	DPS-M / W-GY (as req'd)		SU

Notes: WIDE STILE EXIT DEVICES ACCEPTABLE AT WIDE STILE DOORS
-Weatherstripping/Door edge gasketing furnished by Aluminum Door/Frame supplier.
-Furnish all necessary brackets/spacers and plates necessary for a complete and proper installation of hardware items listed.

Door normally closed and locked.
Valid card read unlocks electric strike for entry.
Key override available.
Door position switch indicates door status.
Free egress at all times.

Set: 4.0

1	Continuous Hinge (AL)	CFM SLF/I-HD1 x Dr Ht		PE
1	Rim Exit (narrow, nightlatch)	19 43 AD8504 Less Pull	US32D	SA
1	Offset Pull (Grip Zone)	RM3411-72 x 12XHD MP	US32	RO
1	Surf Overhead Stop	9-X36	630	RF
1	Closer - Top Jamb	J7500	689	NO
1	Threshold - 5" T-Break	252x3AFG		PE
1	Sweep	315CN		PE
1	Door Position Switch	DPS-M / W-GY (as req'd)		SU

Notes: WIDE STILE EXIT DEVICES ACCEPTABLE AT WIDE STILE DOORS
-Weatherstripping/Door edge gasketing furnished by Aluminum Door/Frame supplier.
-Furnish all necessary brackets/spacers and plates necessary for a complete and proper installation of hardware items listed.

Door position switch indicates door status.

Set: 5.0

1	Continuous Hinge (AL)	CFM SLF/I-HD1 x Dr Ht		PE
1	Rim Exit (narrow, exit only)	19 43 AD8510 EO	US32D	SA
1	Offset Pull (Grip Zone)	RM3411-72 x 12XHD MP	US32	RO
1	Surf Overhead Stop	9-X36	630	RF
1	Closer - Top Jamb	J7500	689	NO
1	Threshold - 5" T-Break	252x3AFG		PE
1	Sweep	315CN		PE
1	Door Position Switch	DPS-M / W-GY (as req'd)		SU

Notes: WIDE STILE EXIT DEVICES ACCEPTABLE AT WIDE STILE DOORS
-Weatherstripping/Door edge gasketing furnished by Aluminum Door/Frame supplier.
-Furnish all necessary brackets/spacers and plates necessary for a complete and proper installation of hardware items listed.

Door position switch indicates door status.

Set: 6.0

6	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
2	Push Bar	RM350 Mtg-Type 1XHD	US32D	RO
2	Straight Pull (Grip Zone)	RM3401-72 Mtg-Type 12HD	US32	RO
2	Surf Overhead Stop	10-X36	630	RF
1	Closer - Top Jamb	J7500	689	NO
1	Automatic Operator	6011 / 6061 (as req'd)	689	NO
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Actuator Button	505		NO

Notes:
Either actuator button opens active leaf automatically.

Set: 7.0

6	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
2	Push Bar	RM350 Mtg-Type 1XHD	US32D	RO
2	Straight Pull (Grip Zone)	RM3401-72 Mtg-Type 12HD	US32	RO
2	Closer x Stop	CLP7500	689	NO
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO

Set: 8.0

1	Continuous Hinge (AL)	CFM SLF/I-HD1 x Dr Ht		PE
1	Push Bar x Offset Pull	RM251	US32D	RO
1	Closer - Top Jamb	J7500	689	NO
1	Wall Stop	402 / 405 (as req'd)	US26D	RO

Notes:
-Furnish all necessary brackets/spacers and plates necessary for a complete and proper installation of hardware items listed.

Set: 9.0

3	Hinge (heavy weight)	T4A3786 (NRP)	US26D	MK
1	Storeroom Lock	10G04 LL	US26D	SA
1	Electric Strike	1500C	630	HS
1	Closer x Stop	CLP7500	689	NO
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	E-Lynx Harness (Frame)	QC-C3000P		MK
1	Card Reader	By Security Vendor	BLK	HD
1	Wiring Diagram	Elevation & Point to Point		OT

Notes:
Door normally closed and locked.
Valid card read unlocks electric strike for entry.
Key override available.
Free egress at all times.

Set: 10.0

3	Hinge	TA2714 (NRP)	US26D	MK
1	Storeroom Lock	10G04 LL	US26D	SA
1	Wall Stop	402 / 405 (as req'd)	US26D	RO

Set: 11.0

6	Hinge	TA2714 (NRP)	US26D	MK
2	Manual Flush Bolt	555/557 (as req'd)	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Storeroom Lock	10G04 LL	US26D	SA
2	Surf Overhead Stop	10-X36	630	RF
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO

Set: 12.0

3	Hinge	TA2714 (NRP)	US26D	MK
1	Storeroom Lock	10G04 LL	US26D	SA
1	Closer	PR7500 / Reg 7500 (as req'd)	689	NO
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Wall Stop	402 / 405 (as req'd)	US26D	RO

Set: 13.0

6	Hinge	TA2714 (NRP)	US26D	MK
1	C/L Flush Bolt (top only, HM)	2805	US26D	RO
1	Storeroom Lock	10G04 LL	US26D	SA
1	Coordinator	2600 Series x FB x Wear Plates	Black	RO
2	Mounting Bracket	2601AB/C	Black	RO
2	Closer x Stop/HO	CLP7500T	689	NO
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO

1 Perimeter Gasketing	S88BL (head & jambs)		PE
1 Astragal Edge Seal	S772D x Dr Ht		PE

Notes:
-Install coordinator, then mounting brackets, then door closer brackets.

Set: 14.0

3 Hinge	TA2714 (NRP)	US26D	MK
1 Storeroom Lock	10G04 LL	US26D	SA
1 Closer x Stop	CLP7500	689	NO
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO

Set: 15.0

6 Hinge	TA2714 (NRP)	US26D	MK
1 SVR-LBR Exit (classroom lever)	43 NB8713 ETL	US32D	SA
2 Closer x Stop/HO	CLP7500T	689	NO
2 Kick Plate	K1050 10" 4BE CSK	US32D	RO

Set: 16.0

6 Hinge	TA2714 (NRP)	US26D	MK
1 Manual Flush Bolt	555/557 (as req'd)	US26D	RO
1 Classroom Lock	10G37 LL	US26D	SA
2 Surf Overhead Stop	10-X36	630	RF

Set: 17.0

6 Hinge	TA2714 (NRP)	US26D	MK
2 Manual Flush Bolt	555/557 (as req'd)	US26D	RO
1 Dust Proof Strike	570	US26D	RO
1 Classroom Lock	10G37 LL	US26D	SA
2 Surf Overhead Stop	10-X36	630	RF
2 Kick Plate	K1050 10" 4BE CSK	US32D	RO

Set: 18.0

3 Hinge	TA2714 (NRP)	US26D	MK
1 Office Lock	10G05 LL	US26D	SA
1 Surf Overhead Stop	10-X36	630	RF

Set: 19.0

3 Hinge	TA2314 (NRP)	US32D	MK
1 Privacy Set (OCC/VAC)	V21 8265 LNL	US26D	SA
1 Kick Plate	K1050 10" 4BE CSK	US32D	RO
1 Mop Plate	K1050 4" 4BE CSK	US32D	RO
1 Wall Stop	402 / 405 (as req'd)	US26D	RO

2	Coat Hook	802	US26D	RO

Set: 20.0

3	Hinge	TA2314 (NRP)	US32D	MK
1	Privacy Set (OCC/VAC)	V21 8265 LNL	US26D	SA
1	Surf Overhead Stop	10-X36	630	RF
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Mop Plate	K1050 4" 4BE CSK	US32D	RO
2	Coat Hook	802	US26D	RO

Set: 21.0

3	Hinge	TA2714 (NRP)	US26D	MK
1	Privacy Set (OCC/VAC)	V21 8265 LNL	US26D	SA
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Wall Stop	402 / 405 (as req'd)	US26D	RO

Set: 22.0

6	Hinge	TA2714 (NRP)	US26D	MK
2	Manual Flush Bolt	555/557 (as req'd)	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Passage Latch	10U15 LL	US26D	SA
2	Door Stop - Post, Wall	474	US26D	RO

Set: 23.0

3	Hinge	TA2714 (NRP)	US26D	MK
1	Passage Latch	10U15 LL	US26D	SA
1	Wall Stop	402 / 405 (as req'd)	US26D	RO

Set: 24.0

3	Hinge	TA2714 (NRP)	US26D	MK
1	Passage Latch	10U15 LL	US26D	SA
1	Surf Overhead Stop	10-X36	630	RF

Set: 25.0

3	Hinge	TA2314 (NRP)	US32D	MK
1	Pull Plate	126x70C	US32D	RO
1	Push Plate	70E	US32D	RO
1	Closer x Stop/HO	CLP7500T	689	NO
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO

Set: 26.0

1	Spring Pivot	4007RB	US26D	MK

2	Door Stop - Post, Wall	474	US26D	RO

Set: 27.0

1	All Hardware	By Door Manufacturer		OT

Set: 28.0

3	Hinge	TA2714 (NRP)	US26D	MK
1	Rim Exit (passage)	43 8815 ETL	US32D	SA
1	Closer	PR7500 / Reg 7500 (as req'd)	689	NO
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Wall Stop	402 / 405 (as req'd)	US26D	RO

Set: 29.0

3	Hinge	TA2714 (NRP)	US26D	MK
1	Rim Exit (classroom lever)	43 8813 ETL	US32D	SA
1	Closer x Stop/HO	CLP7500T	689	NO
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO

Set: 30.0

3	Hinge	TA2314 (NRP)	US32D	MK
1	Rim Exit (NL function)	43 8804 Less Pull	US32D	SA
1	Offset Pull	RM202	US32D	RO
1	Closer x Stop	CLP7500	689	NO
1	Kick Plate	K1050 10" 4BE CSK	US32D	RO
1	Threshold - 6" T-Break	253x3AFG		PE
1	Gasketing	2891AS (head)		PE
2	Gasketing	290AS (jambs)		PE
1	Rain Guard	346C (frame width)		PE
1	Sweep	315CN		PE
1	Door Position Switch	DPS-M / W-GY (as req'd)		SU

END OF SECTION 087100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Definitions: "Glass" includes prime glass, processed glass, laminated glass and fabricated glass products. "Glazing" includes glass installation and materials used to install glass. Types of work in this section include glass and glazing for:

1. Exterior entrance doors and sidelights.
2. Interior entrance doors and sidelights.
3. Glass and glazing for Section 08 41 00 - Aluminum Entrances and Frames.

1.3 QUALITY ASSURANCE:

A. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definition of glass and glazing terms not otherwise defined in this section or other referenced standards.

B. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

C. Single Source Responsibility: Provide materials obtained from one source for each type of glass and glazing product indicated.

1.4 DELIVERY, STORAGE, AND HANDLING:

A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.5 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes. Install glazing sealants only when temperatures are in middle third of manufacturer's recommended installation temperature range.

1.6 SPECIFIED PRODUCT WARRANTY:

A. Warranty on Hermetic Seals: Provide insulating glass manufacturer's written warranty, agreeing to, within specified warranty period, furnish FOB project site, replacement units for insulating glass units which have defective hermetic seals (excluding that due to glass breakage); defined to include intrusion of moisture or dirt, internal condensation at temperatures above -20°F (-31°C), deterioration of internal glass coatings and other visual evidence of seal failure or performance failure; provide manufacturer's instructions for handling, installation, protection and maintenance have been adhered to during warranty period.

B. Warranty period is ten years after seal date permanently imprinted on unit, but not less than nine years after date of substantial completion. Any defective materials shall be replaced, including installation, at no cost to the Owner.

C. Manufacturer's Warranty on Laminated Glass: Provide written warranty signed by manufacturer of laminated glass agreeing to furnish F.O.B. point of manufacture, freight allowed project site, within specified warranty period indicated below, laminated glass units which develop manufacturing defects. Manufacturing defects are defined as edge separation or delamination which materially obstructs vision through glass.

1. Warranty Period: Manufacturer's standard but not less than four years after date of Substantial Completion.

PART 2 - PRODUCTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include but are not limited to the following:

1. AGC Glass Company North America, Inc.
2. Cardinal Glass Industries.
3. Guardian Industries Corp.; SunGuard.
4. Oldcastle BuildingEnvelope.
5. Vitro Architectural Glass
6. Trulite Glass & Aluminum Solutions, LLC.
7. Viracon, Inc.
8. Technical Glass Products

2.1 GLASS PRODUCTS, GENERAL:

A. Primary Glass Standard: Provide primary glass which complies with FS DD-G-451 requirements, including those indicated by reference to type, class, quality, and form.

B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with FS DD-G-1403 requirements, including those indicated by reference to grade, style, type, quality, and class.

C. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses

indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

2.2 PRIMARY GLASS PRODUCTS:

A. Clear Float Glass: Type I, Class I, Quality q3, clear unless otherwise indicated.

2.3 HEAT-TREATED GLASS PRODUCTS:

A. Clear Tempered Float Glass: Grade B (fully tempered), style I (uncoated surfaces), type I (float), quality q3 (glazing quality), class 1 (transparent).

2.4 FABRICATED GLASS UNITS:

A. Insulating Glass:

1. Glass: Provide units of two sheets of 1/4" thick glass with a 1/2" argon gas filled air space and LowE coating on surface #3.

a. Provide tempered glass where called for on drawings and as required by local and state codes..

B. Edge Construction:

1. Twin primary seals of polyisobutylene; tubular aluminum or galvanized steel spacer-bar frame with welded or soldered sealed corners and filled with dessicant; and secondary seal outside of bar, bonded to both sheets of glass or bar, of polysulfide, silicone or hot-melt butyl elastomeric sealant (fabricator's option).

C. Laminated Glass:

1. General: Refer to primary and heat-treated glass requirements relating to properties of uncoated glasses making up laminated glass products.

2. Plastic Interlayer: Provide glass fabricator's standard polyvinyl butyral interlayer for laminating panes of glass, with a proven record of showing no tendency to bubble, discolor or lose physical or mechanical properties after laminating and installation, in clear or colors and of thickness indicated.

3. Laminating Process: Fabricate laminated glass using laminator's standard heat-plus-pressure process to produce glass free from foreign substances and air/glass pockets.

4. Laminated Safety Glass: Two panes of glass of equal thickness, laminated together with a 0.030" thick plastic interlayer and complying with requirements indicated below.

a. Glass Characteristics: Float glass, complying with requirements for class, tint, grade and thickness of each pane (ply) indicated below.

1. Class 1 - clear for both panes.

2. Grade B - tempered.
3. Thickness - as called for on plans.
4. Color of Plastic Interlayer - Clear.

2.5 GLAZING SEALANTS AND COMPONENTS:

A. General: Provide color of exposed sealant/compound indicated or if not otherwise indicated, as selected by Architect from manufacturer's standard colors, or black if no color is so selected. Comply with manufacturer's recommendations for selections of hardness, depending upon the location of each application, conditions at time of installation and performance requirements as indicated. Select materials and variations or modifications carefully for compatibility with surfaces contacted in the installation.

B. 2-Part Polysulfide Glazing Sealant (2Ps-GS): Elastomeric polysulfide sealant complying with FS TT-S-227, Class A, Type 2; specially compounded and tested to show a minimum of 20 years resistance to deterioration in normal glazing applications.

2.6 MISCELLANEOUS GLAZING MATERIALS:

A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Neoprenes or EPDM, 70-90 durometer hardness, with proven compatibility with sealants used.

D. Spacers: Neoprene or EPDM, 40-50 durometer hardness with proven compatibility with sealants used.

E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

F. Compressible Filler (Rod): Closed-cell or waterproof jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

PART 3 - EXECUTION

3.1 STANDARDS AND PERFORMANCE

A. Watertight and airtight installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading, impact loading, (for operating sash and doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.

C. Glazing channel dimensions as shown are intended to provide for necessary bite on glass, minimum edge clearance, and adequate sealant thickness, with reasonable tolerances. Adjust as required by job conditions at time of installation.

D. All glass shall be installed in accordance with manufacturer's recommendations. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channels, and with recommendations of Flat Glass Marketing Association "Glazing Manual", except where more stringent requirements are indicated.

E. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturers Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

3.2 PREPARATION FOR GLAZING:

A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.

B. Apply primer or sealant to joint surfaces where recommended by sealant manufacturer.

3.3 GLAZING:

A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but no closer than 6", unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

B. Provide spacers inside and out, of correct size and spacing, to preserve required face clearances, for glass sizes larger than 50 united inches, except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

D. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

E. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.

F. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

G. Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

H. Clean and trim excess glazing materials from glass and stops or frames promptly after installation, and eliminate stains and discolorations.

3.4 CURE, PROTECTION AND CLEANING:

A. Protect exterior glass from breakage immediately upon installation, by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less often than once a month, for build-up of dirt, scum, alkali deposits or staining. When examination reveals presence of these forms of residue, remove by method recommended by glass manufacturer

D. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

E. Installer shall remove all labels and markings from glass and shall leave the installation free of all heavy construction dirt and sealant smears.

3.5 MONOLITHIC GLASS SCHEDULE

A. Glass Type G-1T: Clear fully tempered float glass.

3.6 INSULATING GLASS SCHEDULE

A. Glass Type IG-1: Clear insulating glass.

1. Basis-of-Design Product: Vito Architectural Glass; Solarban 70.
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Annealed float glass.
5. Interspace Content: Argon.
6. Indoor Lite: Annealed float glass.
7. Winter Nighttime U-Factor:0.24 maximum.

B. Glass Type IG-1T: Clear insulating glass, Tempered.

1. Basis-of-Design Product: Vito Architectural Glass; Solarban 70.
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Fully tempered float glass.
5. Interspace Content: Argon.
6. Indoor Lite: Fully tempered float glass.
7. Winter Nighttime U-Factor:0.24 maximum.

END OF SECTION 08 80 00

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SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

B. Related Requirements:

1. Section 05 40 00 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; and roof rafters and ceiling joists.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For embossed, high-strength steel studs and tracks firestop trackspost-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Horizontal Deflection: For composite wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.

B. Studs and Tracks: ASTM C 645.

1. Steel Studs and Tracks:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) CEMCO; California Expanded Metal Products Co.
2) ClarkDietrich Building Systems.
3) MarinoWARE.
4) MBA Building Supplies.
5) MRI Steel Framing, LLC.
6) Phillips Manufacturing Co.
7) Steel Network, Inc. (The).
8) Telling Industries.

b. Minimum Base-Steel Thickness: As required by performance requirements for horizontal deflection.
c. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide the following:

1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 2-1/2-inchminimum vertical movement.

    a. Products: Subject to compliance with requirements, provide one of the following:

        1) CEMCO; California Expanded Metal Products Co.; Deflex Clips.
        2) ClarkDietrich Building Systems;
        3) Fire Trak Corp;
        4) Steel Network, Inc. (The); VertiClip SLD Series.
        5) Super Stud Building Products Inc.; Deflection Clips.

2. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

    a. Products: provide one of the following:

        1) Blazeframe Industries; Bare Slotted Track (BST/BST 2).
        2) CEMCO; California Expanded Metal Products Co.; .
        3) ClarkDietrich Building Systems; SLP-TRK Slotted Deflection Track.
        4) MBA Building Supplies;
        5) Metal-Lite; The System.
        6) Steel Network, Inc. (The);
        7) Telling Industries;

D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Blazeframe Industries; Intumescent Framing, Fire Stop System.
    b. CEMCO; California Expanded Metal Products Co.; FAS Track.
    c. ClarkDietrich Building Systems; BlazeFrame.
    d. Fire Trak Corp; Fire Trak System attached to studs with Fire Trak Posi Klip.
    e. Metal-Lite; The System.
    f. Perfect Wall, Inc.;
    g. Steel Network, Inc. (The);

E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch- wide flanges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ClarkDietrich Building Systems.
    b. MRI Steel Framing, LLC.

2. Depth: 1-1/2 inches.
3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ClarkDietrich Building Systems.
    b. MRI Steel Framing, LLC.

2. Minimum Base-Steel Thickness:
3. Depth: As indicated on Drawings.

G. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ClarkDietrich Building Systems.
    b. MRI Steel Framing, LLC.

2. Configuration: hat shaped.

H. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ClarkDietrich Building Systems.
    b. MRI Steel Framing, LLC.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Flat Hangers: Steel sheet, in size indicated on Drawings.

E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538 inch and minimum 1/2-inch- wide flanges.

1. Depth: As indicated on Drawings.

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
2. Steel Studs and Tracks: ASTM C 645.

    a. Minimum Base-Steel Thickness: As indicated on Drawings.
    b. Depth: As indicated on Drawings.

3. Embossed, High-Strength Steel Studs and Tracks: ASTM C 645.

    a. Minimum Base-Steel Thickness: As indicated on Drawings.
    b. Depth: As indicated on Drawings.

4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.

    a. Minimum Base-Steel Thickness: As indicated on Drawings.

5. Resilient Furring Channels: 1/2-inch- deep members designed to reduce sound transmission.

a. Configuration: hat shaped.

G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc; Drywall Grid Systems.
b. Chicago Metallic Corporation; .
c. United States Gypsum Company; .

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:

1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
2. Multilayer Application: As required by horizontal deflection performance requirements unless otherwise indicated.
3. Tile Backing Panels: As required by horizontal deflection performance requirements unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.

E. Direct Furring:

1. Screw to wood framing.

2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 07 21 00 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.
4. Texture finishes.

B. Related Requirements:

1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.
2. Section 09 30 13 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

C. Samples for Verification: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than percent.

B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Gypsum.
    b. USG Corporation.

2. Thickness: As indicated on drawings.
3. Long Edges: Tapered.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Gypsum.
    b. USG Corporation.

2. Thickness: As indicated on drawings.
3. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Gypsum.
    b. USG Corporation.

2. Thickness: As indicated on drawings.
3. Long Edges: Tapered.

D. Abuse-Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Gypsum.
    b. USG Corporation.

2. Thickness: As indicated on Drawings.
3. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
4. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.

5. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 3 requirements.
6. Long Edges: Tapered.
7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

E. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture and mold-resistant core and paper surfaces.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum.
b. USG Corporation.

2. Thickness: As indicated on drawings.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum.
b. USG Corporation.

2. Thickness: As indicated on drawings.

2.5 TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. USG Corporation.

2. Thickness: As indicated on Drawings.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

B. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. USG Corporation.

2. Thickness: As indicated on drawings.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

C. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum.
b. USG Corporation.

2. Thickness: As indicated on Drawings. Type C as required by fire-resistance-rated assembly indicated on Drawings.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
f. Expansion (control) joint.
g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

E. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended by backer unit manufacturer.
3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than percent.

D. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. USG Corporation.

E. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

F. Vapor Retarder: As specified in Section 07 26 00 "Vapor Retarders."

2.9 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indexes of not more than 25 when tested according to ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. USG Corporation.

2. Texture: Fine.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: As indicated on Drawings.
3. Ceiling Type: As indicated on Drawings.
4. Abuse-Resistant Type: As indicated on Drawings.
5. Impact-Resistant Type: As indicated on Drawings.
6. Mold-Resistant Type: As indicated on Drawings.
7. Skim-Coated Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

C. Water-Resistant Backing Board: Install where indicated with 1/4-inch gap where panels abut other construction or penetrations.

D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. Bullnose Bead: Use at outside corners.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use at exposed panel edges.
6. Curved-Edge Cornerbead: Use at curved openings.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

E. Aluminum Trim: Install in locations indicated on Drawings.

3.7 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

5. Level 5: Where indicated on Drawings.

    a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written instructions.

3.9 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Waterproof membrane for thinset applications.
3. Crack isolation membrane.
4. Metal edge strips.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
2. Metal edge strips in 6-inch lengths.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of product.

C. Product Test Reports: For tile-setting and -grouting products and certified porcelain tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing tile installation, with minimum of 5 years of documented experience.

B. Maintain one copy of ANSI A108/A118/A136.1 and TCNA (HB) on site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.

1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.

B. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Waterproof membrane.
2. Crack isolation membrane.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

A. See Drawings for manufacturer, style, size, color and installation pattern.

2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Noble Company (The); Nobleseal TS

2.5 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product[, selected from the following,] that complies with ANSI A118.12 for [standard performance] [high performance] and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Chlorinated Polyethylene Sheet: Nonplasticized, chlorinated polyethylene faced on both sides with nonwoven polyester fabric; 0.030-inch nominal thickness.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Noble Company (The); Nobleseal CIS

2.6 SETTING MATERIALS

A. Latex Modified Dry-Set Mortar (Thinset): ANSI A118.4.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Bostik, Inc.
b. Custom Building Products.
c. MAPEI Corporation.
d. TEC / H.B. Fuller Construction Products Inc.

2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
3. Provide product recommended by setting material manufactuer for use over each specific substrate.

2.7 GROUT MATERIALS

A. Wall Tile Installation; Standard Cement Grout: ANSI A118.6.

B. High-Performance Tile Grout: ANSI A118.7.

1. Use sanded grout for porcelain and ceramic tile.
2. Use specific mortar and unsanded grout products as recommended by glass tile manufacturer.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Bostik, Inc.
    b. Custom Building Products.
    c. MAPEI Corporation.
    d. TEC / H.B. Fuller Construction Products Inc.

C. Floor Tile Installations: Water-Cleanable Epoxy Grout: ANSI A118.3.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Bostik, Inc.
    b. Custom Building Products.
    c. MAPEI Corporation.
    d. TEC / H.B. Fuller Construction Products Inc.

2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D 4397, 4.0 mils thick.

C. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Schluter Systems L.P.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate, relative humidity, and alkalinity; obtain instructions if test results are not with the following limits:

    a. Moisture Emission Rate: Not greater than 3lbs per 1000 sq ft per 24 hours, test in accordance with ASTM F1869
    b. Relative Humididty: Within Manufacturer's recommended range, test in accordance with ASTM F2170

c. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710

4. Verify dewpoint and temperature.

a. Use a hydrometer to measure room relative humidity to verify that the room air is not too huymid for adhesive to set properly. It may be necessary to set up aire movement devices, like fans or blowers, or dehumidifiers to precondition the room and maintain proper environment throughout the installation process.
b. Use a standard thermometer to measure the air temperature of the room.
c. Use a special thermometer for measuring concrete surface temperature.
d. Do not install adhesives or floor coverings when either the air temperature or the concrete surface temperature is less than 5 degrees fahrenheit above dewpoint temperature.

5. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
6. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:

a. Exterior tile floors.
b. Tile floors in wet areas.

c. Tile floors consisting of tiles 8 by 8 inches or larger.
d. Tile floors consisting of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortat, excess grout, or too little grout.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

J. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

3.6 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.7 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

3.8 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

END OF SECTION 09 30 13

SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Acoustical tiles for interior ceilings.
2. Fully concealed, direct-hung, suspension systems.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Tiles: Provide complete documentation of each type, color, pattern, and texture.
2. Concealed Suspension-System Members: Provide complete documentation of each type.
3. Exposed Moldings and Trim: Provide complete documentation of each type and color.
4. Seismic Clips: Provide complete documentation of Full size clip.

C. Delegated-Design Submittal: For seismic restraints for ceiling systems.

1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Structural members to which suspension systems will be attached.
3. Method of attaching hangers to building structure.

    a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

4. Items penetrating finished ceiling and ceiling-mounted items including the following:

    a. Lighting fixtures.
    b. Diffusers.
    c. Grilles.
    d. Speakers.
    e. Sprinklers.
    f. Access panels.
    g. Perimeter moldings.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size tiles equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations:

1. Suspended Acoustical Tile Ceilings: Obtain each type of acoustical ceiling tile and its suspension system from single source from single manufacturer.
2. Directly Attached Acoustical Tile Ceilings: Obtain each type of acoustical ceiling tile from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Ceiling products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design seismic restraints for ceiling systems.

C. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A according to ASTM E 1264.
2. Smoke-Developed Index: 50 or less.

D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL or from the listings of another qualified testing agency.

2.3 ACOUSTICAL TILES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. As indicated on drawings.

B. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

C. Color: As indicated on Drawings.

D. Edge/Joint Detail: As indicated on Drawings.

E. Thickness: As indicated on Drawings.

F. Modular Size: As indicated on Drawings.

2.4 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.
2. United States Gypsum Company.

2.5 ACCESSORIES

A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

1. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:

1. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.
2. CertainTeed Corporation.
3. United States Gypsum Company.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for of suspension-system runners.

1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
2. Finish: As indicated on Drawings .

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.

1. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

A. Acoustical Sealant: As specified in Section 07 92 19 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Testing Substrates: Before adhesively bonding tiles to wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

C. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

A. Install suspended acoustical tile ceilings according to ASTM C 636/C 636M, seismic design requirements, and manufacturer's written instructions.

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical tiles as follows:

1. As indicated on reflected ceiling plans.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges of tiles so tile-to-tile joints are interlocked.

1. Fit adjoining tiles to form flush, tight joints. Scribe and cut tiles for accurate fit at borders and around penetrations through ceiling.
2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tiles and moldings, spaced 12 inches o.c.
3. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 INSTALLATION OF DIRECTLY ATTACHED ACOUSTICAL TILE CEILINGS

A. Adhesive Installation: Install acoustical tile by bonding to substrate, using acoustical tile adhesive and procedure recommended in writing by tile manufacturer and as follows:

1. Wipe and prime ceiling.
2. Remove loose dust from backs of tiles by brushing.
3. Install splines in joints between tiles and maintain bottom surface to a uniform level. Shim tile or correct substrate as required to maintain levelness.
4. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.

B. Stapled Installation: Fasten acoustical tile to substrate using a minimum of two staples per tile that are installed in flanges of tile and as follows:

1. Form double-lapped joint between tiles by securely pressing tile tongues into corresponding tile grooves.
2. Maintain bottom surface of tiles to a uniform level. Shim tile or correct substrate as required to maintain levelness.

3. Maintain tight butt joints, aligned in both directions and coordinated with ceiling fixtures.

C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.

D. Arrange directionally patterned acoustical tiles as indicated on Drawings.

3.5 ERECTION TOLERANCES

A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

B. Directly Attached Ceilings: Install bottom surface of tiles to a tolerance of 1/8 inch in 12 feet and not exceeding 1/4 inch cumulatively.

C. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.6 FIELD QUALITY CONTROL

A. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion, but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed installations of acoustical tile ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

B. Acoustical tile ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.

3.7 ADJUSTING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 23

SECTION 09 54 26 - SUSPENDED WOOD CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Panel Grille Ceiling Panels

1.2 RELATED SECTIONS

A. Section 08 31 13 - Access Doors and Frames.

B. Section 28 31 00 - Fire Detection and Alarm.

C. Section 21 00 00 - Fire Suppression.

D. Section 23 37 23.16 - HVAC Gravity Louvered-Penthouse Ventilators.

E. Section 26 51 00 - Interior Lighting.

1.3 REFERENCES

A. ASTM E 84 - Title; 2001.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1:360.

B. Wood is a natural product that will undergo changes with variations in the environment. Therefore, all dimensional tolerances are plus or minus 1/8 inch (3 mm).

C. Fire Performance Characteristics: Suspended wood ceilings shall conform to Class 1, or A flame spread rating, tested according to ASTM E 84; Flame Spread: 25 or less. Smoke Developed: 450 or less.

1.5 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings: Provide layout of suspended wood ceiling and T-rails coordinated with other trades that will penetrate the wood ceiling or interfere with the installation and recessed or surface mounted devices located within the ceiling panels. Indicate method of

suspension where interference exists.

D. Verification Samples: For each finish product specified, two samples, minimum size 12 inches (305 mm) square, representing actual product, color, and patterns.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

F. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic checking and adjustment and periodic cleaning and maintenance of all components.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Minimum 2 years documented experience installing projects of similar size and complexity.

C. Pre-Installation Conference: Convene minimum two weeks prior to starting work of this section. Agenda shall include project conditions, coordination with work of other trades, and layout of items that penetrate ceilings.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver material in the manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Store products off the floor in manufacturer's unopened packaging protected from exposure to harmful environmental conditions and at temperature and humidity conditions as recommended by the manufacturer.

C. A minimum of 72 hours prior to ceiling installation, suspended wood ceilings shall be stored in the room in which they will be installed. Temperature and humidity of the room during this period shall closely approximate those conditions that will exist when the building is occupied.

D. Handle materials to avoid damage.

1.8 SEQUENCING

A. Ensure that locating templates and other information required for installation of products of this section are furnished to affected trades in time to prevent interruption of construction progress.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Plenums have proper ventilation, especially in high moisture areas with no excessive buildup of heat in the ceiling areas.

C. Space shall be fully enclosed with all exterior windows and doors in place, glazed, and weather-stripped. Roof is to be watertight, and all wet trades' work is to be completed, and thoroughly dry.

D. Mechanical, electrical, and other utility services above the ceiling plane shall be completed. No materials should rest against, or wrap around, the ceiling suspension components or connecting hangers.

E. Install only when the temperature and humidity closely approximate the interior conditions that will exist when the building is occupied. Heating and cooling systems shall be operating before, during, and after installation, with the humidity of the interior spaces maintained between 25 and 55 percent, and a temperature between 60 to 90 degrees F.

1.10 COORDINATION

A. Coordinate layout and installation of the wood slats ceiling systems with other work penetrating the ceiling including light fixtures, HVAC equipment, and fire suppression system components.

1.11 EXTRA MATERIALS

A. See Section 01 60 00 - Product Requirements.

B. Deliver materials for Owner's use in maintenance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Rulon International, which is located at: 2000 Ring Way Rd.; St Augustine, FL 32092; Toll Free Tel: 800-227-8566; Tel: 904-584-1400; Fax: 904-584-1499; Email: request info (info@rulonco.com); Web:rulonco.com

B. Substitutions: Permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 MATERIALS - GENERAL

A. Wood is a natural product that will undergo changes with variations in the environment. Therefore, all dimensional tolerances are plus or minus 1/8 inch (3 mm).

2.3 PANEL GRILLE CEILING PANELS

A. General: Standard Panel Grilles are 1 foot (305 mm) wide and in nominal lengths of 2 feet (610 mm) to 10 feet (3048 mm) in 1 inch (305 mm) increments. Actual lengths are 1 inch (25 mm) shorter to allow for a reveal between panels. Wood strips are fabricated without finger-joints, and fastened together with black dowels or woodbackers, depending on panel design. Dowels or woodbackers are positioned 5-1/2 inches (140 mm) from the ends and 12 inches (305 mm) on center, with interconnecting male-to-female dowel attachment or with overlapping woodbackers, depending on panel design for support of the system.
   1. Profiles: Panel Size: As indicated on the Drawings
      a. Size:
         1) Number of Blades per foot: 5
         2) Blade Thickness: ¾”
         3) Depth of the Blades: 2 5/16”
   2. Panel Design Description:
      a. Doweled Panel Grilles:
         1) Grilles consist of individual wood strips assembled in 12 inch widths in lengths up to 10 feet. Wood strips are drilled 12 inches on center, beginning 5-1/2 inch from each end. Dowels are positioned perpendicular to the wood strips. Panel Grilles are 1 inch under an even foot length. Dowels are generally furnished black to be hidden from view. Dowel clips are used to snap the Panel Grilles into place.
   3. Fabric Backing: Provide black fabric backing attached to the back of the Panel Grilles.
   4. Wood Species:
      a. White oak
   5. Finish:
      a. Custom Stain to match Architect’s control sample.

2.4 ACCESSORIES

A. C-Hangers: Suspension hangers that are direct-screwed to the panel and hang over the heavy duty-grid. Hangers are made of spring-steel with phosphate pre-treatment and corrosion-resistant coating.

B. Torsion Springs and Saddle Clips: Two parts of a suspension system in which the torsion spring is direct-screwed to the panel and compressed to attach to the saddle clip that is fitted over the heavy duty-grid. Springs and clips are made of spring-steel with phosphate pre-treatment and corrosion-resistant coating.

C. Dowel Clips: Clips are spring-steel with phosphate pre-treatment and corrosion-resistant coating and are attached by fitting around the dowel and attaching to the grid system.

D. Woodbacker Clips: Clips are spring-steel with phosphate pre-treatment and corrosion-resistant coating and are attached by fitting around the woodbacker and attaching to the grid system.

E. Z-Clips: Male/female aluminum attachment clips, similar to a French cleat but with a thinner profile, used to hang wood wall panels on furring strips.

2.5 SUSPENSION SYSTEMS

A. Main Tees: Standard heavy duty 15/16 inch (24 mm) T-rail specified in Section 09 22 26 - Suspension Systems.

B. Hangers; shall be Suspend ceiling panels from T-rail using torsion springs, C-hangers, or direct screw attachment, as recommended by the manufacturer.

2.6 FABRICATION

A. Edges, borders, and perimeter trims shall be indicated on the Drawings in accordance with the manufacturer's standard design details. All suspended wood ceiling products specified shall be supplied by the wood slat ceiling manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that T-rail carriers specified in Section 09 22 26 - Suspension Systems are in place, suspended and leveled in a direction perpendicular to the wooden strip direction of the wood panels.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Work shall not begin until the space is fully enclosed and glazed and all wet work is completed and dried out to the satisfaction manufacturer.

C. Temperature shall be at least 65 degrees Fahrenheit during the installation and thereafter.

D. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and in proper relationship with adjacent construction, including the following:

B. Use a laser leveling device to lay out and install the perimeter trim as specified.

C. Suspend panels from the T-rail carrier system as indicated.

D. Make final adjustments to level or contours as required.

3.4 FIELD QUALITY CONTROL

A. Technical Service: Manufacturer shall provide a local Technical Service Representative for on-site training and assistance during the installation process.

B. Environmental Monitoring: Manufacturer shall provide a temperature and humidity sensor to actively monitor the room in which the wood slats shall be installed for a minimum of one week before and up to two weeks after installation has been completed including all of the weeks in between.

C. Upon completion of ceiling installation, the owner's representative shall inspect all finished surfaces to ensure that the work has been completed in a manner satisfactory to the owner. Any deficiencies in the install of the ceiling shall be corrected prior to substantial completion.

3.5 ADJUSTMENTS AND CLEANING

A. Clean exposed surfaces of ceiling panel in accordance with manufacturer's instructions.

B. Remove and replace panels and tiles, which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 09 54 26

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Thermoset-rubber base.
2. Rubber molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of product indicated.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.
2. During installation.

3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. As indicated on drawings.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:

a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in areas with resilient floor coverings.
c. Style C, Butt to: Provide in areas indicated.

C. Thickness: 0.125 inch.

D. Height: As indicated on Drawings.

E. Outside Corners: Preformed.

F. Inside Corners: Preformed.

G. Colors: As indicated on drawings.

2.2 RUBBER MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. As indicated on drawings.

B. Description: Rubber Insert description.

C. Profile and Dimensions: As indicated.

D. Locations: Provide rubber molding accessories in areas indicated.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

C. Metal Edge Strips: Brushed chrome anodized aluminum, L-shaped profile with 1/8" (3.2 mm) wide top section, height as required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Tightly adhere to substrates throughout length of each piece.
2. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13

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SECTION 09 65 16 – RESILIENT FLOORING

PART 1.0- GENERAL

1.1 SUMMARY

A. The work of this section includes:

1. Vulcanized Composition Rubber-backed sheet vinyl:
    - Forest Rx, Strait Rx, Cosmos Rx, Infinity Rx & Crossings Rx
2. Unbacked 2mm – Sheet vinyl:
    - Forest 2mm, Strait 2mm, Cosmos 2mm, Infinity 2mm & Crossings 2mm
3. Sanitary Base
4. Weld rod
5. Adhesives:
    - Rubber-backed sheet vinyl E-Grip III or
      E-Grip Tape

B. Related Sections: Section(s) related to this section include:

1. Concrete Substrate: Division 3 Concrete Section(s)

1.2 REFERENCES

A. Standards listed by reference, including revisions by issuing authority, form a part of this specificationsection to extent indicated. Standards listed are identified by issuing authority, authority abbreviation,designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. American Society for Testing and Materials (ASTM):

1. ASTM F970 Standard Test Method for Static Load Limit
2. ASTM F2753 Standard test Method for Dynamic Rolling Load
3. ASTM F1303-99 Standard Test Method for Resistance to Chemicals of Resilient Flooring
4. ASTM F1514 Resistance to heat.
5. ASTM F1515 Resistance to light.
6. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated FloorSurfaces as measured by the James Machine.
7. ASTM E648 Behavior to fire.
8. ASTM F2199 Dimensional stability.
9. ASTM E2129 Standard Practice for Data Collection for Sustainability Assessment of BuildingProducts.
10. ASTM D5116 Standard Guide for Small-Scale Environmental Chamber Determinations ofOrganic Emissions from Indoor Materials/Products

11. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
12. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor SlabsUsing in situ Probes

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide rubber back sheet vinyl resilient flooring, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects,damage or failure.

1.4 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1Submittal Procedures Section.

B. Product Data: Submit product data, including manufacturer's guide specifications product sheet, forspecified products.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, includinganchorage, accessories, finish colors, patterns and textures.

D. Samples: Submit selection and verification samples for finishes, colors and textures.

E. Quality Assurance Submittals: Submit the following:

1. Certificates: If required, certification of performance characteristics specified in this documentshall be provided by the manufacturer.
2. Manufacturer's Instructions: Manufacturer's installation instructions.

F. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operational Data) Section. Include methods for maintaining installed products and precautions against cleaningmaterials and methods detrimental to finishes and performance.
2. Warranty: Warranty documents specified herein.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications: Installer experienced in performing work of this section who hasspecialized in installation of work similar to that required for this project.

   a. Certificate: When requested, submit certificate indicating qualification.

2. Manufacturer's Qualifications: Manufacturer capable of providing field service representationduring construction and approving application method.

B. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer-approvedinstallation methods. Obtain Owner and Architect's acceptance of

finish color, texture and pattern, and workmanship standard. Comply with Division 1 Quality Control (Mock-Up Requirements) Section.

1. Mock-Up Size: 12’-0” x 12’-0”.
2. Incorporation: Mock-up may be incorporated into final construction upon Owner’s approval.

C. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrateconditions, manufacturer’s instructions and manufacturer’s warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

D. Pre-installation Testing: Conduct pre-installation testing as follows: [specify substrate testing; consultwith flooring manufacturer].

1.6 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer’s ordering instructions and lead time requirements to avoidconstruction delays.

C. Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers withidentification labels intact.

D. Storage and Protection: Store materials at temperature and humidity conditions recommended bymanufacturer and protect from exposure to harmful weather conditions.

1.7 PROJECT CONDITIONS

A. Temperature Requirements: Maintain air temperature in spaces where products will be installed fortime period before, during and after installation as recommended by manufacturer.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication;show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.8 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty document executed by authorized company official. Manufacturer’s warranty is in addition to andnot a limitation of, other rights Owner may have under Contract Documents.

1.9 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1Closeout Submittals (Maintenance Materials) Section.

1. Quantity: Furnish quantity of resilient flooring units equal to 10% of amount installed.
2. Delivery, Storage and Protection: Comply with Owner’s requirements for delivery,

storage andprotection of extra materials.

PART 2.0 - PRODUCTS

2.1 MANUFACTURER: Ecore International™

A. Address: 715 Fountain Ave., Lancaster, PA 17601; For pricing and information Contact KRS, Inc. (262) 798-8900; Email: info@krsinc.com

2.2 PROPRIETARY PRODUCT(S)

A. ECORE Commercial flooring and adhesives for commercial applications.

1. Forest Rx, Strait Rx, Cosmos Rx, Infinity Rx & Crossings Rx Vulcanized Composition Rubber-backed resilient sheet vinyl flooring and accessories.
2. Forest 2mm, Strait 2mm, Cosmos 2mm, Infinity 2mm & Crossings Rx Sheet Vinyl flooring andaccessories
3. E-Grip™ III a single-component, zero-VOC, urethane adhesive

2.3.1 Forest Rx, Strait Rx, Cosmos Rx, Infinity Rx & Crossings Rx – Vulcanized Composition Rubber-BackedSheet Vinyl

A.	Product Name: Rubber	The fusion bonded, double-ply, Vulcanized Composition backed vinyl surface furnished under this specification shall beEcore's Forest Rx, Strait Rx, Cosmos Rx, Infinity Rx & Crossings Rx distributed by Ecore Commercial.
B.	Material:	Made from a formulation of Vulcanized Composition Rubber granules encapsulated in a wear and water-resistant elastomeric network fusion bonded to a heterogeneous, PURenhanced, vinyl wear layer
C.	Sheet Dimension:	Overall thickness of 7mm, consisting of a 5mm 6015H Vulcanized Composition Rubber backing, fusion bonded to a 2mm vinyl surface layer having a print film layer of 0.7mm(0.028") and a 1.23mm (0.048") backing ply. Standard roll sizes 6 ft (72") wide by 30 LF [1.828 m by 9.144 m]
D.	Sheet Weight:	1.26 lb/ft^2 [6130 g/m^2]
E.	Sheet Standard Tolerances:	Width: +¾" - 0" | Length: +1% - 0" | Thickness: ± .4 mm
F.	Colors:	As indicated on drawings.
G.	Static Load Limit (ASTM F970):	Pass
H.	Dynamic Rolling Load Change(ASTM F2753)	10,000 cycles: No Damage, No
I.	Coefficient of Friction: 0.6(ASTM D2047)	>
J.	Chemical Resistance:	

	t(ASTM F1303-99)	Excellen
K.	Abrasion resistance: 1(EN 649/EN ISO 10582)	Group T / Type
L.	Dimensional Stability: 0.40%(ASTM F-2199)	+
M.	Behavior to Fire: (ASTM E-648)	Class I
N.	Light Fastness: 6ISO 105-B02 (Method 3)	>
O.	Resistance to Light: (ASTM F-1515)	Pass
P.	Resistance to Heat: (ASTM F-1514)	Pass
Q.	FloorScore:	Pass
R.	CHPS/CA 01350 (ASTM D5116):	Pass

2.3.2 Weld Rod

A.	Product Name:	Welding rod under this specification shall be weld roddistributed by Ecore Commercial.
B.	Material:	Vinyl
C.	Colors:	Specify color from Ecore Commercial standard colors.
D.	Dimensions:	Standard lengths of 328 LF [100 M] by 3mm in thickness.Custom lengths not available.
E.	Spool Weight:	11.023 lbs [5kg]

2.3.3 E-Grip III one-component urethane adhesive for all RX rubber backed products such as Forest Rx, Strait Rx, Cosmos Rx, Infinity Rx &Crossings Rx

A.	Product Name:	The one-part urethane adhesive under this specification shallbe Ecore's E-Grip™ III one-component urethane adhesive.
B.	Material:	E-Grip III is a one-component urethane moisture cured, non-sag, permanently elastic adhesive that has excellent adhesion to elastomers, concrete and wood and is

		engineeredfor indoor and outdoor applications.
C.	Adhesive Type:	One-component urethane
D.	Adhesive Cure System:	Moisture cured
E.	Weight:	4 gallon pail - 56 lbs2 gallon pail - 28 lbs 10.1 oz cartridge – 1.3 lbs.
F.	Color:	medium grey
G.	VOC Content:	0 lb/gal calculated
H.	Freeze/Thaw:	stable
I.	Application Temperature:	40° F - 100° F
J.	Relative Humidity (RH) Test 85%(ASTM F2170)	Maximum
K.	Flashpoint:	> 500° F
L.	Shelf Life:	12 months
M.	Working Time:	30-40 minutes
N.	Trowel:	1/16” x 1/16” x 1/16” square notch (7mm Vinyl Rx)
O.	Coverage Rate:	95 ft^2 / gal. – 1/16” x 1/16” x 1/16”
P.	SCAQMD Rule #1168	0 lb./gal. calculated

2.3 PRODUCT SUBSTITUTIONS

A. Substitutions: Permitted.

2.4 RELATED MATERIALS

A. Related Materials: Refer to other sections listed in Related Sections paragraph herein for relatedmaterials.

2.5 SOURCE QUALITY

A. Source Quality: Obtain Vulcanized Composition Recycled resilient flooring materials from a singlemanufacturer.

PART 3.0 - EXECUTION

3.1 MANUFACTURER’S INSTRUCTIONS

A. Compliance: Comply with manufacturer’s product data, including product technical bulletins, productcatalog installation instructions and product carton instructions for installation.

3.2 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed underother sections, are acceptable for product installation in accordance with manufacturer’s instructions.

3.3 PREPARATION

A. Surface Preparation: [specify applicable product preparation requirements].

3.4 ERECTION/INSTALLATION/APPLICATION/CONSTRUCTION

A. Flooring Installation: Comply with Ecore Commercial Technical Manual for installation procedures andtechniques.

B. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein forrelated products installation.

3.5 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructionsprior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.6 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION 09 65 16

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SECTION 09 65 19 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Luxury vinyl floor tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

C. Samples for Verification: Full-size units of each color and pattern of floor tile required.

D. Product Schedule: For floor tile. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL FLOOR TILE

A. See drawings for manufacturer, color, style, size, and installation pattern.

B. Tile Standard: ASTM F 1700.

1. Class: As indicated by product designations.

C. Installation Method: Direct glue, with manufacturers recommended adhesive.

D. Colors and Patterns: As indicated in drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

    a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install floor tiles until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated.

C. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

D. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

F. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes modular carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet tile installation, plans showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is with a Company specializing in installing carpet with a minimum of three years experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.10 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. See Drawings for manufacturer, style, size, color, and installation direction.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less.

C. Metal Edge/Transition Strips: Extruded aluminum with Architect's choosen finish from manufacturers standard finishes of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 30 00 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Wood Subfloors: Verify the following:

1. Underlayment over subfloor complies with requirements specified in Section 06 16 00 "Sheathing."
2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

E. Metal Subfloors: Verify the following:

1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns indicated on Drawings.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

I. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Concrete.
2. Concrete masonry units (CMUs).
3. Steel and iron.
4. Galvanized metal.
5. Wood.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

B. Samples: For each type of paint system and each color and gloss of topcoat.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As indicated in a color schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMUs): 12 percent.
3. Wood: 15 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Latex System MPI EXT 3.1K:

a. Prime Coat: Latex, exterior, matching topcoat.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).

B. CMU Substrates:

1. Latex System MPI EXT 4.2A:

a. Prime Coat: Block filler, latex, interior/exterior.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).

C. Steel and Iron Substrates:

1. Alkyd System MPI EXT 5.1D:

a. Prime Coat: Primer, alkyd, anticorrosive, for metal.
b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5).

D. Galvanized-Metal Substrates:

1. Alkyd System MPI EXT 5.3B:

a. Prime Coat: Primer, galvanized, cementitious.
b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5).

E. Wood Substrates: wood fences.

1. Latex System MPI EXT 6.3A:

a. Prime Coat: Primer, alkyd for exterior wood.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4).

END OF SECTION 09 91 13

SECTION 09 91 23 – INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints, stains, and varnishes.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Prime surfaces to receive wall coverings.
   3. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
   6. Floors, unless specifically indicated.
   7. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   8. Glass.
   9. Concealed pipes, ducts, and conduits.

1.2 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 2007.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.

C. SSPC-SP 1 - Solvent Cleaning; 2015.

1.3 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general

product category (e.g. "alkyd enamel").
2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.

C. Certificate: Submit manufacturer's certificate indicating compliance to flame-resistance, flame spread and smoke development test results.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Paints:
   1. Base Manufacturer: Sherwin Williams, SW.
   2. Benjamin Moore & Co: www.benjaminmoore.com.
   3. PPG Paints: www.ppgpaints.com.

B. Transparent Finishes:
   1. Base Manufacturer: Sherwin Williams, SW.

C. Stains:
   1. Base Manufacturer: Sherwin Williams, SW.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Colors: To be selected from manufacturer's full range of available colors.
   1. Selection to be made by Architect after award of contract.
   2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.3 PAINT SYSTEMS - INTERIOR

A. Paint WI-OP-3A - Wood, Opaque, Acrylic- Alkyd, 3 Coat:
   1. One coat of alkyd primer sealer; Minimum Dry-film Thickness: 2.0 mils; SW, Premium Wall and Wood Primer, B28W8111.
   2. Semi-gloss: Two coat of water-based enamel; Minimum Dry-film Thickness: 3.4 mils; SW, ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss, B34-8200.

B. Paint WI-TR-V - Wood, Transparent, Varnish, No Stain:
   1. One coat sealer.
   2. Satin: One coat of varnish ; SW, MinwaxWaterbased Oil-Modified Poyurethane.

C. Paint WI-TR-VS - Wood, Transparent, Varnish, Stain:
   1. One coat of stain ; SW, Minwax Performance Wood Stain
   2. One coat sealer .
   3. Satin: Two coats of varnish; alkyd or polyurethane varnish; applied at

manufacturer's recommended rate; SW, S-W Minwax Performance Series Fast-Dry Oil Varnish.

D. Paint CI-OP-3L - Concrete/Masonry, Opaque, Latex, 3 Coat:
   1. One coat of block filler; Minimum Dry-film Thickness: 8.0 mils; SW, PrepRite Block Filler, B25W25.
   2. Low-Luster: Two coats of Latex Acrylic; Minimum Dry-film Thickness: 3.2 mils ; SW, ProMar 200 Zero Latex Eg-Shel Enamel, B20-2600.

E. Paint MI-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
   1. One coat of alkyd primer.
   2. Primer: Rust-inhibitive alkyd; Minimum Dry-film Thickness: 2.4 mils; SW, Kembond HS Universal Primer, B50 Series.
   3. Semi-Gloss: Two coats alkyd enamel; Minimum Dry-film Thickness per coat: 3.0 mils; SW, ProMar 200 Acrylic Alkyd Semi-Gloss, B34 Series.

F. Paint MI-OP-3LV - Ferrous Metals, Primed, Low VOC, 3 Coat:
   1. Touch-up Primer: Quick drying, rust-inhibitive, latex primer; Minimum Dry-film Thickness:
      3.0 mils; SW, ProCyl Universal Primer, B66-1310.
   2. Flat: Low-odor latex; Minimum Dry-film Thickness: 1.7 mils; SW, Harmony Low-Odor Interior Latex - Flat, B5 Series
   3. Semi-gloss: Semi-gloss Low-odor Latex; Minimum Dry-film Thickness: 1.6 mils; SW, Harmony Low Odor Interior Latex - Semi-gloss, B10 Series.

G. Paint MI-OP-2LA - Dry Fall Ferrous Metals, Unprimed, Acrylic, 2 Coat:
   1. Primer: Rust-inhibitive alkyd; Minimum Dry-film Thickness: 2.0 to 5.0 mils; SW, Kem bond HS, Gray, B50AZ8.
   2. Flat: One coat waterborne acrylic dry fall; SW, Pro Industrial Waterborne Acrylic Dry Fall, White, B42-181
   3. Egg Shell: One coat waterborne acrylic dry fall; SW, Pro Industrial Waterborne Acrylic Dry Fall, White, B42-80.

H. Paint MI-OP-1LA - Dry Fall Ferrous Metals, Primed and Galvanized, unless otherwise recommended by manufacturer, Acrylic, 1 Coat:
   1. Touch-up with alkyd primer. Clean and prime rust spots
   2. Flat: One coat waterborne acrylic dry fall ; SW, Pro Industrial Waterborne Acrylic Dry Fall, White, B42-181
   3. Egg Shell: One coat waterborne acrylic dry fall ; SW, Pro Industrial Waterborne Acrylic Dry Fall, White, B42-80.

I. Paint MI-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Primer: Rust-inhibitive alkyd; Minimum Dry-film Thickness: 2.4 mils; SW, Kembond HS Universal Primer, B50 Series.

J. Paint GI-OP-3LA - Gypsum Board/Plaster, Latex-Acrylic, 2 or 3 Coat:
   1. One coat of Alkyd or latex primer sealer; Minimum Dry-film Thickness: 1.0 mils, verify with finish coat system; SW, ProMar 200 Zero VOC Latex Primer, B28W2600.
   2. Semi-gloss: Latex-acrylic enamel; Minimum Dry-film Thickness: 2.6 mils; SW, ProMar 200 Latex Semi-Gloss, B31.
   3. Eggshell: Latex-acrylic enamel; Minimum Dry-film Thickness: 1.6 mils; SW,

ProMar 200 Latex Eg-Shel, B20W2600 Series.

4. Flat: Latex-acrylic; Dry-film Thickness: 1.4 mils per coat; SW, Pro-Mar 200 Latex Flat, B30-2600.

K. Paint GI-OP-3LV - Gypsum Board/Plaster, Latex-Low-VOC, 3 Coat:
   1. One coat of Alkyd or latex primer sealer; Minimum Dry-film Thickness: 1.3 mils, verify with finish coat system; SW, Harmony Interior Latex Primer, B11W900.
   2. Flat: Low-odor latex; Minimum Dry-film Thickness: 1.7 mils; SW, Harmony Low-Odor Interior Latex - Flat, B5 Series
   3. Semi-gloss: Semi-gloss Low-odor Latex; Minimum Dry-film Thickness: 1.6 mils; SW, Harmony Low Odor Interior Latex - Semi-gloss, B10 Series.
   4. Eggshell: Low-luster Low-odor Latex; Minimum Dry-film Thickness: 1.6 mils; SW, Harmony Low Odor Interior Latex, Eg-Shel, B9 Series.

L. Paint GI-OP-3E - Gypsum Board and Coated Glass Mat Gypsum Backer Board, Epoxy, 3 Coat:
   1. One coat of Latex primer sealer; Minimum Dry-film Thickness: 1.0 mils, verify with finish coat system; SW, ProMar 200 Zero VOC Latex Primer, B28W2600.
   2. Gloss: Water-based Epoxy System; Minimum Dry-film Thickness: 2.0 to 5.0 mils; SW, Pro Industrial Water-Based Catalized Epoxy, Gloss, B73-300 Series
   3. Eggshell: Water-Based Epoxy System; Minimum Dry-film Thickness: 2.0 to 5.0 mils; SW, Pro Industrial Water-Based Catalized Epoxy, Eg-Shel, B73-360.
   4. Gloss (optional top coat for color stability): Waterbaed Urethane: ProIndustrial Waterbased Acrolon 100, B65-720 (4.0-8.0 mils wet, 1.8-3.6 mils dry per coat).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or

finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Concrete:

1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

H. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

I. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

J. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

END OF SECTION 09 91 23

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SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall guards.
2. Corner guards.
3. End-wall guards.
4. Wall panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.
2. Include fire ratings of units recessed in fire-rated walls and listings for door-protection items attached to fire-rated doors.

B. Shop Drawings: For each type of wall and door protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.[Show handrail design and support spacing required to withstand structural loads.]

C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Wall Guards: 12 inches long. Include examples of joinery, corners, [end caps,] [top caps,] and field splices.
2. Corner and End-Wall Guards: 12 inches long. Include example top caps.
3. Abuse-Resistant Wall Covering: 6 by 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of handrail.

B. Material Certificates: For each type of exposed plastic material.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of wall and door protection product to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining best condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to finishes and performance.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store wall and door protection in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic materials out of direct sunlight.
3. Store plastic wall- and door-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

a. Store corner-guard covers in a vertical position.
b. Store wall-guard covers in a horizontal position.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall- and door-protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in [the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities] [and] [ICC A117.1] <Insert requirement>.

2.3 WALL GUARDS

A. Bumper Rail: Standard-duty assembly consisting of continuous snap-on plastic cover installed over concealed retainer; designed to withstand impacts.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. InPro Corporation (IPC).
b. Series: As indicated on drawings

c. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness.

d. Profile: .
e. Color and Texture: As indicated on drawings.

2. End Caps and Corners: Prefabricated, injection-molded plastic; matching color cover; field adjustable for close alignment with snap-on cover.
3. Accessories: Concealed splices and mounting hardware.

2.4 CORNER GUARDS

A. Surface-Mounted, Vinyl Corner Guards: with 90- or 135-degree turn to match wall condition.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. InPro Corporation (IPC).

2. Series: As indicated on drawings.

3. Material: Extruded aluminum, minimum 0.0625 inch thick.
4. Wing Size: Nominal Insert dimensions.

2.5 END-WALL GUARDS

A. Surface-Mounted, Vinyl, End-Wall Guards: Fabricated from one-piece, formed vinyl that covers entire end of wall; with formed edges.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

a. InPro Corporation (IPC)

2. Series:
3. As indicated on drawings.

4. Material: Extruded aluminum, minimum 0.0625 inch thick.
5. Wing Size: Nominal Insert dimensions.

2.6 WALL PANELS

A. Wall Panels - Type WP-1: One-piece unit, installed with adhesive.
1. Material: Polyvinyl chloride, Color: As indicated on drawings.
2. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E 84.
3. Thickness: 0.030 (1/32) inch, minimum.
4. Size: 36 by 96 inches; verify height from top of base to ceiling.
5. Texture: As selected.
6. Accessories:
   a. Top cap, inside corner, divider bar, and outside corner moldings of matching polyvinyl chloride.
   b. Sealant: Color matched sealant provided by manufacturer.
7. Manufacturer and Product:
   a. C/S Group; Acrovyn High-Impact Wall Covering: www.c-sgroup.com
   b. Inpro Corp.; IPC Rigid Vinyl Sheet: www.inpro.com
   c. Koroseal; Korogard Protective Wallcovering: www.koroseal.com
   d. Substitutions: See Section 01 60 00 - Product Requirements.

2.7 MATERIALS

A. Plastic Materials: Chemical- and stain-resistant, high-impact-resistant plastic with integral color throughout; extruded and sheet material as required, thickness as indicated.

B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or Class 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft.-lbf/in. of notch when tested according to ASTM D 256, Test Method A.

C. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.

D. Adhesive: As recommended by protection product manufacturer.

2.8 FABRICATION

A. Fabricate wall and door protection according to requirements indicated for design, performance, dimensions, and member sizes, including thicknesses of components.

B. Curved Panels: Preform curved semirigid, abuse-resistant sheet wall covering in factory for radius and sheet thickness as follows:

1. Sheet Thickness of 0.040 Inch: 24-inch radius.
2. Sheet Thickness of 0.060 Inch: 36-inch radius.

C. Factory Assembly: Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.

D. Quality: Fabricate components with uniformly tight seams and joints and with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

E. Wood Handrails: Miter corners and ends of wood handrails for returns.

2.9 FINISHES

A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances[, fire rating,] and other conditions affecting performance of the Work.

B. Examine walls to which wall and door protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

1. For wall and door protection attached with adhesive, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing wall and door protection.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. Installation Quality: Install wall and door protection according to manufacturer's written instructions, level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Accessories: Provide splices, mounting hardware, anchors, trim, joint moldings, and other accessories required for a complete installation.

1. Provide anchoring devices and suitable locations to withstand imposed loads.
2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.
3. Adjust end and top caps as required to ensure tight seams.

C. Abuse-Resistant Wall Covering: Install top and edge moldings, corners, and divider bars as required for a complete installation.

D. Fire Doors: Install protection according to the listing of each item.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

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SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.

B. Related Requirements:

1. Section 09 30 13 "Ceramic Tiling" for ceramic toilet and bath accessories.

1.2 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Samples: For each exposed product and for each finish specified, full size.

1. Approved full-size Samples will be returned and may be used in the Work.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

D. Delegated Design Submittal: For grab bars.

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.5 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

A. Owner-Furnished Materials: Paper towel dispensers, Toilet paper dispensers and Soap dispensers.

2.2 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Structural Performance: Design accessories and fasteners to comply with the following requirements:

1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain [public-use washroom accessories] [each type of public-use washroom accessory] from single source from single manufacturer.

B. Grab Bar:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Bobrick Washroom Equipment, Inc.
    b. Bradley Corporation.

2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.

    a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin)[on ends and slip-resistant texture in grip area].

4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

C. Mirror Unit:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

    a. Bobrick Washroom Equipment, Inc.
    b. Bradley Corporation.

2. Frame: Stainless steel channel.

    a. Corners: Manufacturer's standard.

3. Size: As indicated on Drawings.

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

1. Remove temporary labels and protective coatings.

B. Grab Bars: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fire department access key storage box and accessories.

1.2 RELATED SECTIONS

A. Owner's building alarm system, for connection of tamper switch.

1.3 REFERENCE STANDARDS

A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

B. ASTM A 1008/A 1008M - Standard Specification for Steel, Sheet, Cold-rolled, Carbon, Structural, High-strength Low-alloy, High-strength Low-alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

C. UL437 - Standard for Safety for Key Locks

D. UL 1037 - Antitheft Alarms and Devices

E. UL 1610 - Central Station Alarm Units

F. UL 1332 - Organic Coatings for Steel Enclosures for Outdoor Use Electrical Equipment

1.4 SUBMITTALS

A. Product Data: Include construction details, dimensions of individual components and profiles, and accessories.

B. Registration Form: Fire Department registration form identifying responsible persons, authorized signatures, number of access keys, if access box is shared with other agencies, and terms and conditions of agreement.

C. Maintenance Data: Include manufacturer's recommended cleaning and maintenance directions.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Knox, Product: 3200 Series: www.knoxbox.com

B. Substitutions: As provided for under Section 01 60 00 - Product Requirements

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M

B. Stainless-Steel Sheet: ASTM A 666, Type 304.

2.3 KEY ACCESS BOX

A. Box: 1/4-inch thick welded steel case with 1/2-inch thick hinged steel door with interior gasket and stainless steel hinge; box and lock UL listed.

1. Size: To be determined by Local Fire Department to accommodate necessary keys/cards
2. Lock cover: 1/8-inch thick stainless steel with tamper seal mounting capacity.
3. Mounting: Surface

B. Lock: UL 437, Double-action rotating tumbler and hardened steel pins accessed by biased cut key.

1. Provide single-lock

C. Fasteners: 3/8 inch diameter, Grade 5 or 8 carriage or hex bolts with washers

D. Tamper Switch: UL 1037 and UL 1610 listed tamper switch monitoring door.

END OF SECTION 10 44 00

SECTION 10 44 13 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguisher.

B. Related Requirements:

1. Section 10 44 16 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.

2.3 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Activar Construction Products Group, Inc. - JL Industries.
b. Larsens Manufacturing Company.

B. Cabinet Construction: Nonrated or One-hour fire rated. See drawings for locations

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Cold-rolled steel sheet.

D. Recessed Cabinet:

1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

E. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).

1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

F. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

G. Cabinet Trim Material: Same material and finish as door.

H. Door Material: Steel sheet.

I. Door Style: Vertical duo panel with frame.

J. Door Glazing: Tempered float glass (clear).

K. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide manufacturer's standard.
2. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

L. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate .

    a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

        1) Location: Applied to cabinet glazing.
        2) Application Process: Diecut.
        3) Lettering Color: Red.
        4) Orientation: Vertical.

M. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

    a. Finish: Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603.
    b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
    c. Color: As selected by Architect from manufacturer's full range.
2. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Miter corners and grind smooth.
3. Provide factory-drilled mounting holes.
4. Prepare doors and frames to receive locks.
5. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames and grind smooth.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for hose [valves][racks] and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessedsemirecessed cabinets will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessedandsemirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
4. Fire-Rated Cabinets:

    a. Install cabinet with not more than 1/16-inch tolerance between pipe OD and knockout OD. Center pipe within knockout.
    b. Seal through penetrations with firestopping sealant as specified in Section 07 84 13 "Penetration Firestopping."

C. Identification:

1. Apply vinyl lettering at locations indicated.
2. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Owner-Furnished Material: Hand-carried fire extinguishers.

C. Related Requirements:

1. Section 10 44 13 "Fire Protection Cabinets."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10 when testing interval required by NFPA 10 is within the warranty period.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. JL Industries, Inc.; a division of the Activar Construction Products Group.
b. Larsens Manufacturing Company.

2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
3. Valves: Manufacturer's standard.
4. Handles and Levers: Manufacturer's standard.
5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry-Chemical Type in Steel Container <Insert drawing designation>: UL-rated 4-A:80-B:C, 10-lbnominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

END OF SECTION 10 44 16

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SECTION 10 71 13 – EXTERIOR SUN SHADING DEVICES

PART 1 - GENERAL

SUMMARY

A. Provide fixed Custom Sunshades as shown on the drawings, as specified, and as needed for a complete and proper installation.
B. The drawings show the extent of the work, the dimensioned profile and depth of the sunshade to be provided.
C. Related work specified elsewhere:
    1. Metal Fabrication – 05 50 00

INDUSTRY STANDARD

A. Reference:
    1. National Association of Architectural Metal Manufacturers (NAAMM)
    2. American Architectural Manufacturers Association (AAMA)

SUBMITTALS

A. Product Data: Submit specifications, technical and descriptive data, and installation instructions from the manufacturer of the sunshades.
B. Shop Drawings:
    1. Submit shop drawings for the system for architects and engineers approval prior to commencment of any work or fabrication. Submit __6__ sets of shop drawings for approval.
        a. Engineer of record to verify and analyze sunshade clip attachment to structure for local code and loads such as dead, live, snow, wind, thermal movement, and any collateral loads (e.g. light fixtures or signage) that my be mounted to sunshade.
    2. Show anchorage, details and connections for all the component parts, including connection of mounting clip to structure and adjacent construction.
    3. Drawings shall include plans, sections, and specific details for each unit.
    4. Drawings shall detail appropriate materials, alloys, and finishes of all parts including installation hardware.
C. Warranty: Provide written warranty to the owner that all screen products will be free of defective materials or workmanship for a period of one (1) year from date of installation.
D. Structural Calculations: Submit analysis of shade connection to mounting bracket by a professional engineer considering design loads such as dead, live, snow, wind, thermal movement, and any collateral loads (e.g. light fixtures or signage) that my be mounted to sunshade.

QUALITY ASSURANCE

A. Single subcontract responsibility: Subcontract the work to a single firm that has had not less than five (5) years experience in the design and manufacturing of work similar to that is required.

B. Manufacturer must show evidence of having wholly owned manufacturing facilities. Outsourcing to a subcontracted manufacturer for assembly is not acceptable.
C. Manufacturer must operate, design, assemble, and finish their product in the United States of America as a “Made in America” product. All materials must be procured from sources inside the United States of America.

PART 2 - PRODUCTS

MATERIALS
A. Aluminum Extrusion Blades: ASTM B211, Alloy 6063-T5.
B. Aluminum Plate ASTM B211, Alloy 6061-T6.
C. Fasteners: Fasteners shall be stainless steel. Provide types, gauges and lengths to suit unit installation conditions.
D. Anchors and Inserts: Use non-Ferrous metal or hot dip galvanized anchors and inserts for installation and elsewhere as required for corrosion resistance. Use stainless steel or zinc galvanized expansion bolt devices for drill-in place anchors. Furnish inserts, as required, to be set into concrete or masonry work. Field weld clips

FABRICATION, GENERAL
A. Provide fixed Sunshades and accessories of design, material, sizes, depth, arrangement, and thickness as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.
B. Include supports, anchorage, and accessories required for complete assembly, including all attachment clips and necessary hardware for attachment to structure.
C. Manufacturer shall allow +/- 1/8” thermal expansion room at each shade to compensate for dissimilar movement between building structure and aluminum sunshade structure. This design shall be incorporated as to not induce self destructing loads onto either shade or building veneer.
D. No blade fasteners shall be visible after installation of sections. Provide cover plates at each outrigger end to conceal fasteners. Only mounting hardware shall be visible after installation.

SUNSHADE CONSTRUCTION
A. Components:
    1. All fascia & blades shall be 6063-T5 aluminum-extruded members.
        a. Blade infill shall be custom designed with integral screw boss that is hidden from view visible after installation. Size and spacing is to be as shown on the architectural details. Blade infill shall be airfoils, rectangle or tubular sections.
        b. Blades to be miter cut and fitted to outrigger plates at mitered corner conditions.
    2. Outrigger components shall be 6061-T6 aluminum plates.
        a. Outriggers shall be tapered or shaped aluminum flat plates, screwed to aluminum extrusion blades via countersunk fastener holes. Connections of aluminum extrusions to outriggers should be flush with no protruding fasteners

visible after installation. Outriggers are pre-drilled for mounting to the structural sunshade clip tab via stainless steel expansion slip connection to compensate for thermal expansion.

3. Clip brackets shall be of carbon steel.
    a. Connection of sunshade to building shall be friction type with the ability to properly level the shade during installation.
4. Outrigger cover plates shall be furnished of 6061-T6 aluminum plates at each end of sunshade run to cover extrusion fasteners.

B. Assembly: Components to be shop assembled in large practical sections to allow for immediate installation. Sections indicated on shop drawings to be assembled and shipped as units with cover plates and support arms, if required, shipped loose.
    1. Fasteners shall be bagged in groups clearly identifying bolt locations and bag contents for easy installation. Manufacturer to provide anti-seze compound for any field bolted stainless hardware to facilitate proper erection.

ALUMINUM FINISH FOR SUN SHADES

A. General: Comply with NAAMM "Metal Finishes Manual" Chapter 1 NAMM-2604-05 for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after product assembly. Remove scratches and blemishes from exposed surfaces, which will be visible after completing finishing process.
B. Type: Factory applied super durable powder coating. Finish shall have enhanced resistance to fading, chalking, gloss retention that meets or exceeds AAMA 2604.
C. Pretreatment:
    1. Manufacturer to pre-sand, sandblast, or timesave all surfaces to be painted in a linear direction.
    2. Applicator to pretreat the aluminum with solutions to remove organic an dinorganic surface slils, remove residual oxides, followed by an optional chrome phospahate conversion coating – at minimum 30mg/ft^2 – to ensure adhestion of paint to the aluminum (AAMA 6.0).
D. Application: One primer coat, one color coat, for a minimum of 1.2 mills of dry film thickness.
E. Color: Provide color as indicated or, if not otherwise indicated, as selected by architect from standard colors.
        a. Colors as chosen by architect from: (Also available are all RAL Colors)
            1) Roman Haas: Regal Ultra Series
            2) Tiger Drylac: Series 38
            3) Spraylat: Arc 2001
            4) Or approved equal
F. Finish Warranty: Furnish manufacturer’s twenty (20) year limited warranty against adhesion loss, and standard ten (10) year limited warranty against gloss retention.

STEEL CLIP FINISH

A. General: Comply with NAAMM "Metal Finishes Manual" Chapter 4 for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory

after product assembly. Remove scratches and blemishes from exposed surfaces, which will be visible after completing finishing process.

B. Type: Factory applied super durable powder coating. Finish shall have enhanced resistance to fading, chalking, and loss of gloss that meets or exceeds AAMA 2604.
C. Pretreatment:
    1. Manufacturer to degrease parts to remove any dirt, oils, or other debris.
    2. Applicator to pretreat with a chrome phospahate conversion coating – at minimum 30mg/ft^2 – to ensure proper adhesion to metal surface (AAMA 6.0).
D. Application: One coat epoxy zinc rich primer, one color coat, for a minimum 1.2 mills of dry film thickness.
E. Color: Provide color as indicated to match sunshade.
F. Finish Warranty: Furnish manufacturer's twenty (20) year limited warranty against adhesion loss, and standard ten (10) year limited warranty against gloss retention.

PART 3 - EXECUTION

MATERIAL INSPECTION

A. Examine crates and reconcile to a shipping manifest or packing slip. Verify all required components are present.

FIELD DIMENSIONS / SITE INSPECTION

A. Prior to Clip Installation:
    1. Verify conditions: Examine areas where work is to be performed and identify any conditions that could be dtrimental to proper or timely completion.
B. Prior to Shade Installation:
    1. Contractor Shall field confirm openings widths and elevations as shown on shop drawings prior to fabrication of shade sections. Field dimensions of clip locations shall be verified prior to fabrication of sections.
C. Installation of sections should not proceed until all conditions are satisfactory.

INSTALLATION / ERECTION

A. Comply with manufacturer's instructions and recommendations for installation of the work.
B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated, and fitted to the structure.
C. Anchor Sunscreen to building substructure as indicated on the sunshade shop drawings and verified by the engineer of record.
D. Erection Tolerances:
    1. Clips or Mounting Brackets:
        a. Elevation clip Variation from level: 1/8" maximum in any column to column space or 20'-0" runs, non-cumulative.
        b. Offsets in projection of clips front leading edge 1/16"+/-.
        c. Veneer or Wall construction tolerance around clip projection. 1/4"+ outward.
        d. Clip Plumbness: 1/16" in 6"

e. Clip projection level: 1/16” in 12”

2. Shade Sections:
    a. Projection Level: 1/8” in 4’-0”
    b. Horizontal Level: 1/8” max in any column to column space or in 20’-0” runs, non-cumulative.
    c. Shade section to section variation 1/32” at adjoining sections.

E. Cut and trim component parts during erection only with the written approval of H&H Enterprises, Inc., and in accordance with H&H’s recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly as directed by H&H Enterprises.
F. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.
G. Set units level, plumb and true to line, with uniform joints.
H. Erect sunshade sections after all adjacent painting, masonry (including chemical treatments), roofing, electrical, glazing, and other similar work is completed above and below the shade sections.

CLEANING

A. Clean exterior sunshades surfaces to prevent buildup of dust and debris. Clean sunshades as outlined in AAMA 609/610-02. “*Cleaning and Maintenance Guide for Architecturlly Finishes Aluminum”* or NAAM Metal Finishes Manual “Cleaning Procedures” 1-13/1-14

PROTECTION

A. Protect Sunshade materials after installation to prevent damage by other trades. Special attention shall be taken to ensure no equipment or personell stands on top of sunshade system, nor sunshade system is used to hang any type of tarp or similar barricade or signage other than the design intent. Schedule should dictate that sunshades are one of the last erected items to help mitigate damage to the shading system.

END OF SECTION 10 71 13

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SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single and/or double rollers.
2. Motor-operated roller shades with single and/or double rollers.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 07 92 00 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 10 inches long.

C. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 3 inches square. Mark interior face of material if applicable.

D. Product Schedule: For roller shades. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of shadeband material.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. MechoShade Systems, Inc.
2. Springs Window Fashions; SWFcontract.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Manufacturer's standard .

a. Loop Length: As indicated on Drawings.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Chain tensioner, jamb mounted.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.

a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade, unless adjacent conditions prohibit clearance and operation requirements.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method .

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

F. Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material .
b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open.

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

    a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open.

3. Endcap Covers: To cover exposed endcaps.
4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

    a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open.
    b. Provide pocket with lip at lower edge to support acoustical ceiling panel, where necessary.

5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
6. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    1. MechoShade Systems, Inc.
    2. Springs Window Fashions; SWFcontract.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

    1. Bead Chains: Manufacturer's standard .

        a. Loop Length: Full length of roller shade.
        b. Limit Stops: Provide upper and lower ball stops.
        c. Chain-Retainer Type: Chain tensioner, jamb mounted.

    2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.

a. Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.
2. Inside Roller:

a. Drive-End Location: Right side of interior face of shade, unless adjacent conditions prohibit clearance and operation requirements.
b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

3. Outside Roller:

a. Drive-End Location: Right side of interior face of shade, unless adjacent conditions prohibit clearance and operation requirements.
b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

4. Shadeband-to-Roller Attachment: Manufacturer's standard method .

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

F. Inside Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material .
b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Outside Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material .

b. Color and Finish: As selected by Architect from manufacturer's full range.

H. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open,.

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

   a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open.

3. Endcap Covers: To cover exposed endcaps.
4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

   a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open.
   b. Provide pocket with lip at lower edge to support acoustical ceiling panel, where necessary.

5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.

   a. Closure-Panel Width: As indicated on Drawings.

6. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.4 MOTOR-OPERATED, SINGLE-ROLLER SHADES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. MechoShade Systems, Inc.

2. Springs Window Fashions; SWFcontract.

B. Motorized Operating System: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Manufacturer's standard tubular, enclosed in roller.

    a. Electrical Characteristics: 110-V ac.
    b. Maximum Total Shade Width: As required to operate roller shades indicated.
    c. Maximum Shade Drop: As required to operate roller shades indicated.
    d. Maximum Weight Capacity: As required to operate roller shades indicated.

3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:

    a. Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for single-switch group control.
    b. Individual/Group Control Station: Momentary-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
    c. Color: As selected by Architect from manufacturer's full range.

4. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
5. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
6. Operating Features:

    a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
    b. Capable of interface with audiovisual control system.
    c. Capable of accepting input from building automation control system.
    d. Override switch.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: Right side of interior face of shade, unless adjacent conditions prohibit clearance and operation requirements.
2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
3. Shadeband-to-Roller Attachment: Manufacturer's standard method .

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly.

F. Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

    a. Type: Enclosed in sealed pocket of shadeband material .
    b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

    a. Shape: L-shaped.
    b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open.

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

    a. Height: Manufacturer's standard in height required to enclose roller and shadeband assembly when shade is fully open.

3. Endcap Covers: To cover exposed endcaps.
4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

    a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open.
    b. Provide pocket with lip at lower edge to support acoustical ceiling panel, where necessary.

5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.

    a. Closure-Panel Width: As indicated on Drawings.

6. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.5 MOTOR-OPERATED, DOUBLE-ROLLER SHADES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. MechoShade Systems, Inc.
2. Springs Window Fashions; SWFcontract.

B. Motorized Operating Systems: Provide factory-assembled, shade-operator systems of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Manufacturer's standard tubular, enclosed in rollers.

    a. Electrical Characteristics: 110-V ac.
    b. Maximum Total Shade Width: As required to operate roller shades indicated.
    c. Maximum Shade Drop: As required to operate roller shades indicated.
    d. Maximum Weight Capacity: As required to operate roller shades indicated.

3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:

    a. Individual/Group Control Station: [Maintained] [Momentary]-contact, three-position, rocker-style, wall-switch-operated control station with open, close, and center off functions for individual and group control.
    b. Color: [As selected by Architect from manufacturer's full range] <Insert color>.

4. Crank-Operator Override: Crank and gearbox operate shades in event of power outage

or motor failure.

5. Limit Switches: Adjustable switches, interlocked with motor controls and set to stop shade movement automatically at fully raised and fully lowered positions.
6. Operating Features:

    a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
    b. Capable of interface with [audiovisual] [multiroom] <Insert description> control system.
    c. Capable of accepting input from building automation control system.
    d. Override switch.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shades for service.

1. Double-Roller Mounting Configuration: Offset, outside shade over and inside shade under.
2. Inside Roller:

    a. Drive-End Location: Right side of interior face of shade, unless adjacent conditions prohibit clearance and operation requirements.
    b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

3. Outside Roller:

    a. Drive-End Location: Right side of interior face of shade, unless adjacent conditions prohibit clearance and operation requirements.
    b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

4. Shadeband-to-Roller Attachment: Manufacturer's standard method .

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

F. Inside Shadebands:

1. Shadeband Material: Light-filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Enclosed in sealed pocket of shadeband material .
b. Color and Finish: As selected by Architect from manufacturer's full range.

G. Outside Shadebands:

1. Shadeband Material: Light-blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Exposed with endcaps and integral light seal where bottom (sill) channels are indicated.
b. Color and Finish: As selected by Architect from manufacturer's full range.

H. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

a. Shape: L-shaped.
b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open.

2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open.

3. Endcap Covers: To cover exposed endcaps.
4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

a. Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open.
b. Provide pocket with lip at lower edge to support acoustical ceiling panel.

5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recesses or pockets and for snap-in attachment to wall clip without fasteners.

a. Closure-Panel Width: As indicated on Drawings.

6. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.

7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.6 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant, as specified on drawings.

C. Light-Blocking Fabric: Opaque fabric, stain and fade resistant, as specified on drawings.

2.7 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch . Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch , plus or minus 1/8 inch .
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, [locations of connections to building electrical system,]and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

C. Roller Shade Locations: As indicated on Drawings.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

END OF SECTION 12 24 13

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SECTION 12 36 23.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes plastic-laminate-clad countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating that product contains no urea formaldehyde.
2. Product Data: For installation adhesives, indicating VOC content.
3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For plastic-laminate-clad countertops.

1. Include plans, sections, details, and attachments to other work. Detail fabrication and installation, including field joints.
2. Show locations and sizes of cutouts and holes for items installed in plastic-laminate-clad countertops.

D. Samples: Plastic laminates in each type, color, pattern, and surface finish required in manufacturer's standard size.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator.

B. Product Certificates: For the following:

1. Composite wood and agrifiber products.
2. High-pressure decorative laminate.

3. Chemical-resistant, high-pressure decorative laminate.
4. Adhesives.

C. Quality Standard Compliance Certificates: AWI Quality Certification Program.

D. Manufacturer and Installer to provide letter indicating that work was performed in compliance with AWI standards.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Shop Certification: AWI's Quality Certification Program accredited participant.

B. Installer Qualifications: Fabricator of products AWI's Quality Certification Program accredited participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.

B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

C. Keep surfaces of countertops covered with protective covering during handling and installation.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

B. Grade: Custom.

C. High-Pressure Decorative Laminate: NEMA LD 3.

1. Manufacturers, Colors, Patterns and Finishes: As indicated on drawings.

D. Edge Treatment: Postformed laminate; front edge substrate built up to minimum 1-1/2 inch thick with radiused edge, integral coved backsplash with radiused top edge.

E. Core Material: Particleboard.

F. Core Material at Sinks: Particleboard made with exterior glue.

G. Core Thickness: 3/4 inch.

1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

H. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.

1. Composite Wood Products: Products shall be made without urea formaldehyde.
2. Particleboard: ANSI A208.1, Grade M-2.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products according to test method indicated by a qualified testing agency.

1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

2.4 ACCESSORIES

A. Wire-Management Grommets: Circular, molded-plastic grommets and matching plastic caps with slot for wire passage.

1. Outside Diameter: 2 1/2 inches.
2. Color: As indicated on drawings.,

2.5 MISCELLANEOUS MATERIALS

A. Adhesives: Do not use adhesives that contain urea formaldehyde.

B. Adhesive for Bonding Plastic Laminate: Contact cement.

1. Adhesive for Bonding Edges: Hot-melt adhesive.

2.6 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:

1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times countertop fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended, and check measurements of assemblies against field measurements before disassembling for shipment.

D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of cutouts by saturating with varnish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical-treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

F. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inchesvariation from a straight, level plane.
2. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where not possible to repair, replace countertops. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semiexposed surfaces.

C. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 12 36 23.13

SECTION 12 36 61.16 - SOLID SURFACING COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.
4. Solid surface material apron fronts.
5. Solid surface material sinks.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials[and sinks].

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

D. Samples for Verification: For the following products:

1. Countertop material, 6 inches square.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. As indicated on drawings.

2. Type: Provide Standard type unless Special Purpose type is indicated.
3. Integral Sink Bowls: Comply with CSA B45.5/IAPMO Z124.
4. Colors and Patterns: As indicated on drawings.

B. Composite Wood Products: Products shall be made without urea formaldehyde.

C. Particleboard: ANSI A208.1, Grade M-2.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Custom.

B. Configuration:

1. Front: 1-1/2-inch radius.
2. Backsplash: Straight, slightly eased at corner.
3. End Splash: Matching backsplash.

C. Countertops: 3/8-inch- thick minimum, solid surface material laminated to 3/4-inch- thick particleboard with exposed edges built up with 3/4-inch- thick, solid surface material.

D. Backsplashes: 3/4-inch thick, solid surface material.

E. Fabricate tops with shop-applied edgesunless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

F. Joints: Fabricate countertops without joints.

G. Cutouts and Holes:

1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

a. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop

2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

H. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

1. Seal edges of cutouts in particleboard subtops by saturating with varnish.

I. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 61.16

SECTION 21 00 00 - FIRE PROTECTION SPRINKLER WORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Work Included:
1. General
2. Design Criteria
3. Pipe and Fittings
4. Hangers and Supports
5. Escutcheons
6. Valves
7. Sprinklers
8. Alarm Devices
9. Access Panels
10. Pressure Gauges
11. Fire Department Connection
12. Air Compressor
13. Pipe Identification
14. Openings, Cutting and Sleeves
15. Remodeling and Demolition
16. Building Access
17. Lubrication
18. Electrical Work
19. Welder Qualifications
20. Operating Instructions
21. Hazardous Substances
22. Rubbish Removal
23. Guarantee
24. Tests

B. Work Not Included:
1. Painting of Pipe
2. Electrical wiring, other than low voltage of devices provided within this Section.

1.02 RELATED SECTIONS

A. Applicable provisions of Division 1 govern work under this section.

B. This section applies to all Division 21 sections of fire protection.

C. Section 07 84 00 – Firestopping

D. Section 10 44 00 – Fire Protection Specialties

E. Section 23 09 13 – Instrumentation and Control Devices for HVAC: Dampers

F. Section 26 27 17 – Equipment Wiring: Electrical characteristics and wiring connections.

G. Section 28 31 00 – Fire Detection and Alarm

1.03 REFERENCES

A. FM P7825 - Approval Guide; Factory Mutual Research Corporation; current edition.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; current edition.

C. NFPA 13 - Standard for the Installation of Sprinkler Systems; National Fire Protection Association; current edition.

D. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

A. All materials, appliances and equipment to be new, U.L. and FM approved, of best quality and grade, in strict accordance with these specifications all rules and regulations governing the installation of this Contractors work on this project

B. Architect and Engineer reserve the right to select a full line of materials, appliances and equipment in the event that items listed are not in accord with specification requirements, rules and regulations governing work on this project, or of best quality and grade. Architect and Engineer's selection shall be final and binding upon Contractor. Only those materials, appliances and equipment approved by Architect and Engineer may be used.

C. Submit shop drawings covering the following items:
- Valves
- Sprinkler Heads
- Fittings
- Pipe and Fittings
- Air Compressor
- Fire Department Connection
- Dry valve and Accessories
- Alarm Devices
- Sprinkler Accessories
- Backflow Preventer
- Hangers and Supports

D. Shop drawings are to detail all sleeves as required for installation governed by this Section and/or under the Specification's General Requirements.

E. Shop drawings to comply with NFPA 13; Chapter 8. Sprinkler drawings shall be prepared on AutoCAD software. Final as-built drawing submittal shall include electronic copy of as-builts. Drawing sizes shall match Architectural drawings for consistency.

F. Sprinkler pipe shop drawings are to have all the required approvals prior to any work proceeding. Designers stamp or Professional Engineer's stamp is required on sprinkler shop drawings submitted for approval. Title block to include Contractor's License Number. Record drawings are required for final acceptance of work.

1.05 GENERAL

A. Fire Protection bidders shall submit design/build bid accompanied by Outline Specification and description of work. The Fire Protection Contractor shall be responsible for the design and performance of their system and submittal, including submittal fees to local building inspection department, State or authorities having jurisdiction and Owner's insurance carrier for approval.

B. Fire Protection Contractor shall assume full responsibility for a final layout and details required by these drawings, specifications and authority or authorities having jurisdiction, including to miss all lighting, HVAC and structural interferences.

C. Any work installed without regard for other trades that in the opinion of the Architect or Engineer must be moved to permit proper installation, shall be moved or modified at no additional cost to the Owner.

1. Exposed piping is not permitted in finished spaces.

2. Final design layout is subject to review and comments by Architect and Engineer.

D. Authorities having jurisdiction shall be the State, the Owner, the City, the Owner's insurance company, and NFPA 13 Requirements. Where a conflict exists, the most stringent shall apply.

E. Contractor shall provide whole, complete, tested and duly approved system per all latest edition NFPA requirements, including furnishing of all labor, material and equipment and performance of all operations necessary for proper installation and operation, shall be included in the work and Contractor's bid, the same as if specified or shown. Secure all permits and pay all fees.

F. The System Design shall be as outlined within the project scope. Charts and construction drawings shall be submitted to Architect, Engineer, State, City Fire Prevention and Owner's Insurance Underwriter for approval, as well as any other authority having jurisdiction. Shop drawings must have all approvals prior to fabrication and installation of the Fire Protection System.

G. The Sprinkler coverage is within the entire building addition, including attic, overhangs, entrance canopies and elevators. The system is to be wet, and dry in any areas subject to freezing per NFPA 13. Water supply is from a new water service as indicated on the plans.

H. The Sprinkler System Design shall include additional sprinklers as required by NFPA should adequate sprinkler distribution be obstructed and/or combustible blind spaces exist.

I. Any drawings provided of the existing building and/or the fire sprinkler drawings are provided for information only and are not to be considered completely accurate. The fire protection contractor is responsible for verifying all of the information contained in any and all documents provided.

J. Provide all necessary components for complete approved automatic fire sprinkler systems for the project. This includes, but is not limited to, control valves with supervisory switches, water flow switches, alarm switches, drain valves, inspector's test connections, code compliant water supply and all necessary components to make complete operational code compliant and approved systems. Any oversights or deviations in the design and or installation of the fire sprinkler systems shall be the contractor's own responsibility and no additional compensation will be awarded.

K. Provide drain at main riser and all trapped areas of systems. All main drains shall be properly drained to the exterior and be of sufficient capacity for full flow discharge.

L. Visit to site and become thoroughly familiar with all conditions affecting this project. Ignorance of field conditions affecting work, will not be considered as reason for additional cost of work above Contract Price.

1.06 DESIGN CRITERIA

A. Entire building addition areas shall be 100% provided with sprinklers (no unsprinkled spaces). Provide dry system for attic, canopies and overhangs in excess of 4'-0''. Provide capped connections for future additions.

B. Hydraulic calculations shall be provided as specified below with submittals and attachments to each calculation. The attachment of equipment cuts, i.e. sprinkler head(s), backflow preventer, meters, shall include a cover sheet summarizing the area calculated with a flow curve showing system demand and supply. The system demand is to have a minimum design pressure safety factor of 10%. The Sprinkler Contractor is to comply with additional safety margins required by the Plan Review Agency.

C. Occupancies:

1. Offices, Public Areas, Classrooms, Attic, Locker: To be classified "Light Hazard" with design densities as required by NFPA or Manufacturers Listing for the type of sprinkler selected, standard or quick response. Maximum spacing shall conform to the listing of the sprinkler head. Hose allowances of 100 GPM to be included in sprinkler calculations.

2. Mechanical, Unassigned, Storage, Kitchen, Equipment Platform, Shops: To be classified "Ordinary Hazard Group I" with design densities as required by NFPA or Manufacturers Listing for the type of sprinkler selected, standard or quick response. Maximum spacing shall conform to the listing of the sprinkler head. Hose allowances of 250 GPM to be included in sprinkler calculations.

3. Entire remodeled areas within Project Limits are to be provided with an Automatic Fire Protection Sprinkler System. In existing areas that have an Automatic Fire Protection Sprinkler System presently installed: Remove piping supports and all other associated items that interfere with new General, Electrical, and Mechanical Installations & reinstall System for proper coverage of new layout or remodel existing system as required. Refer to Architectural reflected ceiling plan for grid and ceiling layout. Locate sprinkler heads in center of tiles.

D. Flow test at the corner of 8th Ave & Lincoln St:

Static:	84 PSI
Residual:	67 PSI
Flow:	1061 GPM

Water test data is preliminary for bidding purposes. Successful Contractor to provide Flow Test to verify existing pressures and flow at site. Tests to be representative of high water use periods. Submit results to Architect and Engineer before proceeding with design of system.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Above Floor:

1. Steel Pipe

a. Black steel pipe welded and seamless, Type F, Grade A, ASTM A53; black welded and seamless steel pipe for fire protection use, Type F, ASTM A795; electric resistance welded pipe, Grade A, ASTM A135.

b. Threaded lightwall pipe is not acceptable.

c. Pipe Wall Thickness: Schedule 40 for welded, rolled groove, cut groove and threaded. Schedule 30 for welded, rolled groove, 8" and larger cut groove and 8" and larger threaded piping. Schedule 10 up to and including 6" for rolled groove and welded. 0.188" for 8" and 10" rolled groove and welded.

d. Fittings: 2" and Under – Cast iron threaded fittings, Class 125 or 250, ASTM A126/ANSI B16.4. Malleable iron threaded fittings, Class 150 or 300, ASTM A197/ANSI B16.3. Standard weight seamless carbon steel weld fittings, ASTM A234 Grade, ANSI B16.9. Mechanical grooved fittings with EPDM gaskets, ASTM A536 ductile iron, ASTM A47 malleable iron or ASTM A53 fabricated steel.

e. Welding Materials: Comply with section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.

f. Finish: Hot dipped zinc coated (galvanized) finish on piping and fittings shall be used in dry sprinkler or combined pipe systems, preaction systems, piping exposed to weather and piping exposed to corrosive environments. Thread or cut groove hot dipped zinc coated pipe ends for fitting connections. Indoor dry standpipe systems, supplied by a Fire Department connection only, may be black steel piping and fittings.

2. Copper Pipe

a. Type L copper water tube, H (drawn) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; copper phosphorous brazing alloy, AWS A5.8 BcuP. Mechanically formed brazed tee connections may be used in lieu of specified tee fittings for branch takeoffs up to one-half (1/2) the diameter of the main.

3. CPVC Pipe

a. Pipe: ASTM F 442/F 442M, SDR 13.5.
b. Fittings: ASTM F 438 Schedule 40, or ASTM F 439 Schedule 80, CPVC
c. Joints: Solvent welded, using ASTM F 493 cement.

4. Pipe and fittings provided must be new and free of all rust and oil.

5. Flexible sprinkler hose fittings shall be fully welded, braided, leak-tested stainless steel with a minimum internal corrugated hose diameter of 1-inch true bore, working pressure of 200 psi, and a temperature rating of 225°F. All flexible systems shall be UL Listed and FM Approved. Drops to be furnished complete with ceiling bracket with removable attachment hub. Flexible drops shall be as manufactured by AquaFlex, FlexHead, Gateway Tubing, Victaulic or Viking.

A. Underground:

1. New underground main shall be as shown on drawings. Installation of main shall be as required by NFPA 24. Pipe runs located under any pavement areas shall require properly compacted back fill material. Restoration of any existing pavements, sidewalks, or plantings are required.

2. Pipe to be of a slip joint ductile iron with mechanical joint fittings. Pipe wall thickness shall be as allowed by the Local Water Authorities, Insurance Underwriter or NFPA 24, whichever is most stringent.

3. Valves and/or 2 way hydrants indicated on plans shall be of the approved type.

4. Prior to connection, Fire Protection Contractor is to confirm that the new underground has been tested and flushed as required by NFPA.

2.02 HANGERS AND SUPPORTS

A. Support piping as required by NFPA 13. Sprinkler piping with a diameter of 3 inches and larger are to be supported from trapeze hangers when piping runs parallel to roof or floor supports.

B. All hangers, pipe supports, threaded rod, hardware, etc. shall be zinc plated or galvanized steel in the Waterpark, Pool, Pool Equipment, Chemical Storage Rooms, and rooms with a corrosive environment.

2.03 ESCUTCHEONS

A. Provide escutcheons on all exposed pipe passing through finished floors, walls, and ceilings. Chrome-plated metal escutcheons to be of proper size on pipe and diameter sufficient to cover sleeved and/or patched opening.

2.04 VALVES

A. Control Valves:

1. Valves shall be by Milwaukee, Nibco, Grinnell, Kennedy, Central, Reliable, Star, Watts or equal and shall be U.L./FM approved.

2. Inside control valves may be OS&Y or Butterfly Valves, type as allowed by the Insurance Authority or as required by NFPA.

3. Exterior control valves shall be as approved by the Insurance Authorities and NFPA.

B. Backflow Preventer:

1. Double check backflow assembly shall be provided as indicated on the drawings. Ames or equal with a 5/8 inch bypass or as required by the Local Municipality.

C. Ball Valves:

1. 2” and smaller: Bronze, 2-piece, threaded or sweat ends, standard port, blowout proof stem, chrome plated ball, glass reinforced seats, UL approved @ 250 psi. Watts No. B-6000 UL.

D. Gate Valves:

1. 2” and smaller: Outside screw and yoke gate valves, 175 psig, bronze mounted, screwed bonnet, rising stem, solid wedge, with normally open tamper switch with double wire leads.

2. 2-1/2” and larger: Outside screw and yoke gate valves, 175 psig, bronze mounted, bolted bonnet, rising stem, solid wedge, with normally open tamper switch with double wire leads.

3. 4’’ and larger: Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly. Clow F-5750.

E. Butterfly Valves:

1. 2” and smaller: Bronze body butterfly valve, 175 psig, geared operator, visible position indicator, normally open tamper switch with double wire leads, Buna or Viton seat, stainless disc and stem.

2. 2” and larger: Cast or ductile iron body butterfly valve, lug style or grooved, 175 psig, geared operator, visible position indicator, normally open tamper switch with double wire leads, EPDM resilient seat, EPDM seals, nickel plated ductile iron disc. Valve assembly to be bubble tight to 175 psig with no downstream flange/pipe attached. Use cap screws for removal of downstream piping while using the valve for system shutoff.

F. Check Valves:

1. 3” and smaller: Bronze body, threaded end, Y-pattern, regrindable bronze seat, renewable bronze disc, 175 psig, suitable for installation in a horizontal or vertical line with flow upward.

2. 2-1/2” and larger: Cast or ductile iron body, flanged or grooved ends, bronze trim, bolted cap, renewable bronze seat and disc, 175 psig, suitable for installation in a horizontal or vertical line with flow upward.

G. Spring Loaded Check Valves:

1. 2” and smaller: Bronze body, threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, 175 psig, teflon seat unless only bronze available.

2. 2-1/2” and larger: Cast or ductile iron body, wafer or globe type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required, 175 psig.

H. Drain Valves:

1. ¾'' minimum two or three piece bronze body ball valve; threaded ends, chrome plated bronze ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 400 psig WOG, with hose thread outlet and cap.

I. Alarm Check Valves:

1. Cast or ductile iron body, flanged or grooved ends, 175 psig, bronze grooved seat with o-ring seal, single hitch pin and latch design. Provide trim for bypass, drain, electric sprinkler alarm switch, pressure gages, precision retarding chamber, drip cup assembly piped to floor or hub drain, fill line attachment with strainer.

J. Dry Pipe Valves:

1. Cast or ductile iron body, flanged or grooved ends, 175 psig, bronze grooved seat with o-ring seal, single hitch pin and latch design. Provide trim for air supply, drain, priming level, alarm connections, pressure gages, priming chamber attachment, ball drip valves, drip cup assembly piped to floor or hub drain, fill line attachment with strainer.

K. Air Pressure Maintenance Device

1. Automatic control capable of maintaining system air pressure, rated for 175 psig, adjustable air pressure range of 15 to 60 psig, complete with isolation valves, bypass fill valve, pressure regulator or pressure switch and strainer.

L. Deluge Valves:

1. Cast or ductile iron body, flanged or grooved ends, 175 psig, bronze grooved seat with o-ring seal. Provide trim for bypass, drain, electric sprinkler alarm switch, pressure gages, drip cup assembly piped to floor or hub drain, fill line attachment with strainer and push rod chamber assembly. Include dry pilot trim consisting of actuator, air and water pressure gages, low air warning switch, air relief valve and diaphragm actuation device with replaceable bronze seat and resilient diaphragm.

M. Deluge/Preaction Control:

1. Single area type in NEMA 1 enclosure with detector, alarm, power supply, battery charger, standby battery, electrically supervised solenoid valves, polarized fire alarm, lamp test, wiring terminal strip, auxiliary alarm contacts.

2.05 SPRINKLERS

A. Sprinkler heads shall be of the proper temperature rating as required per NFPA.

Type of heads shall be as follows:

1. Exposed brass upright or pendant heads (exposed piping) shall be glass bulb or solder link, standard or quick response or as required by NFPA 13 in rooms without suspended ceilings. Extended coverage sprinklers may be used at Contractor's option.

2. Concealed flush pendant heads with flat cover plate, color to match ceiling, to be standard or quick response or as required by NFPA 13 in areas with suspended or drywall ceilings. See "Room Finish Schedule". Sprinkler heads are to be located center of ceiling module. Extended coverage sprinklers may be used at Contractor's option.

3. Sidewall recessed, white sprinkler heads standard horizontal type with matching escutcheon plate.

4. Dry sprinklers standard pendant in areas with suspended ceiling or upright type in areas without suspended ceiling, brass finish.

B. A mountable box with spare heads of each type with proper wrenches shall be provided. Number of spare heads as designated per NFPA 13.

C. Heads shall be as manufactured by Central, Star, Reliable, Viking or equal.

D. Select fusible link or glass bulb temperature rating not to exceed maximum ambient temperature rating allowed under normal conditions at installed location. Provide ordinary temperature (155 degree) fusible link or glass bulb type except at skylights, sealed display windows, unventilated attics and roof spaces, over cooking equipment, adjacent to diffusers, unit heaters, uninsulated heating pipes or ducts, mechanical rooms, storage rooms, or where otherwise indicated.

2.06 ALARM DEVICES

A. Provide water alarm switch at the system riser and tamper switch at each system control valve.

B. Provide contacts for monitoring Fire Protection Sprinkler System by an approved supervising station per Code Chapter 9 – Fire Protection Systems and NFPA-72.

C. Flow Switches: Vane type waterflow switch with metal enclosure, adjustable pneumatic retard and electrical characteristics compatible with alarm system.

D. Pressure Switches: Pressure actuated switch with field adjustable settings, metal enclosure and electrical characteristics compatible with alarm system.

E. Local Alarm Bell: Weatherproof electric alarm bell with red painted metal housing, mounting base and gong; solenoid operator; weatherproof o-ring seal and electrical characteristics compatible with alarm system.

F. Switches: Locate flow and pressure switches where indicated and where required to obtain specified zoning to isolate floors and major areas of floors. Provide valved test connection for flow switch adjacent to flow switch. Pipe to floor drain. Test flow switch to verify proper operation.

G. Coordinate electrical requirements with Electrical Engineer and Electrical Contractor.

2.07 ACCESS PANELS

A. Install all piping, conduit, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster wall or ceilings, furnish the access doors to the General Contractor.

B. Furnish access panels for all valves, or other equipment requiring adjustment or servicing, concealed within walls, furred spaces or ceilings. Panels shall be minimum size of 12 inch x 12 inch or of size to provide adequate access. Panels installed in fire rated walls or floors are to match rating. If insufficient service access exists the Architect shall be contacted for his decision.

C. Panels shall be Milcor by Inland Steel Products Company, Zurn or other approved equal, with screwdriver cam locking devices, and to be of the following styles:

1. Style “A” for acoustical tile surfaces.
2. Style “B” for acoustical plaster surfaces.
3. Style “K” for plaster surfaces.
4. Style “M” for masonry and tile surfaces.
5. Style “DW” for drywall surfaces.

D. Removable lay-in ceiling tiles in 2’ X 2’ or 2’ X 4’ configuration provided under Architectural Division are sufficient; no additional access provisions are required unless specifically indicated.

E. Refer to Room Finish Schedule on Architectural Drawings for location of applicable wall and ceiling surfaces and finishes.

F. Deliver access panels to other Contractor at job site for installation by the other Contractor, where and as directed by this Contractor.

2.08 PRESSURE GAUGES

A. Manufacturer: Ametek/U.S. Gauge Division, Ashcroft, Marsh, Taylor, H.O. Trerice, Weiss or Weksler.

B. Cast aluminum, stainless steel or brass case of not less than 3.5 inches in diameter, double strength glass window, black lettering on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from the front of the dial, 99% accuracy over the middle half of the scale, 98.5% accuracy over the remainder of the scale. Include bronze 3-way globe valve with plugged outlet for Fire Inspector's test gauge.

2.09 FIRE DEPARTMENT CONNECTION

Manufacturer: Badger-Powhatan, Croker, Elkhart Brass, J.W. Moon, Potter-Roemer, and W.D. Allen.

A. Coordinate style and location with local fire department.

1. Exposed Siamese: Polished cast brass (chrome plated) exposed fire department inlet, two-way inlet body, swing clappers, pin-lug swivels and plugs with chains, 2-1/2" National Standard female hose thread inlets, 6" (4") outlet, cast brass (chrome plated) lettered identification backplate.

2. Flush Siamese: Polished cast brass (chrome plated) flush fire department inlet, two-way inlet body, swing clappers, pin-lug swivels and caps with chains, 2-1/2" National Standard female hose thread inlets, 6" (4") outlet, cast brass (chrome plated) lettered identification backplate.

3. Storz: 5 or 6 inch connection provided with a brass body polished brass (chrome plated) wall plate. Style to be flush. Provide proper identification on wall plate.

2.10 AIR COMPRESSOR

Manufacturer: Quincy, Ingersoll-Rand, Nash, and Viking.

A. Multi-zone and large systems: Simplex electric motor belt driven oil lubricated compressor mounted on ASME rated galvanized receiver tank, pressure operated electric switch, motor, magnetic motor starter with three phase overload protection, fused disconnect switch, safety relief valve, check valve, shut-off valve, pressure gauge, automatic tank drain, intake muffler-filter, belt guard and adjustable operating pressure control.

B. Single zone and small systems: Riser pipe mounted air compressor installation. Electric motor driven, air cooled, oil-less, adjustable, single stage compressor. With check valve, pressure switch, pressure relief valve, mounting bracket kit and air filter assembly. Equal to Viking Model E-1.

C. Air Compressor: Install on concrete housekeeping pad, leveled and bolted in place. Pipe automatic drain to floor drain. Install line size ball valve and check valve in discharge line. Install pressure gauge upstream of ball valve.

PART 3 - EXECUTION

3.01 GENERAL

A. Sprinkler main and branch piping shall be installed as high as possible to provide maximum usable height for the occupants and Owner. Coordinate routing with plumbing, HVAC, and electrical contractors. Precedence in installing equipment, piping, ductwork, and conduit will be as determined by the Architect and Engineers. No contractor has exclusive right of way in installing his work.

B. Inspector test connections and low point drains shall be installed as per NFPA requirements and provided where required. Termination height shall be no higher than 36” above finished floor and in no case less than 24” above finished grade.

C. Provide guards on all heads in low position or subject to mechanical damage.

D. Provide spray shields on heads located near electrical panels and transformers to prevent direct spray onto said equipment as allowed by NFPA.

3.02 PIPE IDENTIFICATION

A. All pipe installation shall be identified by painting and name stenciling or with labels. Identification shall be done after painting of pipe if pipe is specified to be painted by Project Documents.

B. Identification shall be done at intervals not to exceed 20 feet and at least once in each room penetrated by pipe lines located so as to be visible from floor or through access panel. If it is necessary to vary the above scheme of identification for any reason, the Architect shall be consulted.

C. Name stencil in contrasting color. Show pipe content and flow. Sizes of lettering shall be as recommended by manufacturers of adhesive labels for the diameter of piping involved.

D. Labels and Banding: W.H. Brady, T & B/Wrestling, Emend Co., or Seton Name Plate Corporation. Letters shall be sized as recommended by the manufacturers for the diameter of piping involved. Color code banding at each end of label, full circumference of pipe, shall be applied with 3 inch minimum overlap.

E. Identify each valve (hose valves excluded) by means of neat one inch diameter brass or copper tag fastened to body of valve with copper or brass chain or S hook. Identification number shall be stamped into tag. Provide a color coded tack in ceiling or wall where valves are located.

F. Identify all valves with signs as required by NFPA.

G. Coordinate pipe identification, valve tags and valve charts with Facility Standards.

H. Match any existing system and add valve numbering to existing valve charts.

3.03 OPENINGS, CUTTING AND SLEEVES

A. Provide as necessary to permit installation of piping or any other part of work under this Section. Cooperate with other trades and adjust with them, subject to Architect's approval, all questions of interference, right-of-way for piping, etc. Make all arrangements with various Contractors for any special framing, spacing or chases. Accurately locate all openings, provide and set all sleeves in cooperation with Contractor whose work is affected thereby.

B. Sleeves to be one inch larger than outside pipe diameter and of sufficient length to pass through entire floor or wall construction. Sleeves in concrete or masonry walls or floors shall be Schedule 40 galvanized steel pipe. All other sleeves #22 gauge galvanized sheet metal. Sleeves in floors shall extend 2 inches above finished floor.

C. Holes through reinforced concrete shall be core drilled. Chopping or breaking out will not be permitted. Obtain Architect's approval before cutting, drilling or coring through concrete or masonry in place, and then proceed as directed.

D. All openings through fire rated floors and walls shall be sealed so as to maintain the fire rating of the structure.

3.04 REMODELING AND DEMOLITION

A. Perform all demolition as indicated on the drawings and in these specifications to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Owner to minimize disruption to the existing building occupants.

B. Do not interrupt or change existing services without prior written approval from the Owner or Architect. When interruption is required, coordinate scheduling of downtime with the Owner to minimize disruption to activities. Notify proper authorities when system is interrupted.

3.05 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.06 ELECTRICAL WORK

A. All line voltage wiring shall be by the Electrical Contractor.

B. Fire Protection Contractor shall furnish combination fused switches and starters and wiring diagrams for electrical equipment furnished to the Electrical Contractor.

C. Prior to ordering any and all equipment which require electrical connections, coordinate with Division 26 for the correct horse power and voltage at the site. The cost associated with any equipment ordered with the wrong voltage will be the responsibility of Fire Protection Contractor to correct.

D. Fire Protection Contractor shall be responsible for furnishing and installation of low voltage wiring and connections for equipment furnished by Fire Protection Contractor, including hiring of a State Licensed Electrical Contractor for required wiring.

3.07 WELDER QUALIFICATIONS

A. Welding procedures, welders, and welding operators for all building service piping to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for Piping and Tubing. Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of ASME B31.9 Building Services Piping.

B. The Architect or Engineer reserves the right to test the work of any welder employed on the project, at the Owner’s expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project and all defective welds replaced.

3.08 OPERATING INSTRUCTIONS

A. Instruct Owner’s personnel in the proper operation, maintenance, and testing of systems and equipment provided as a part of this project. Using the Operation and Maintenance Manual and record drawings during this instruction. Demonstrate testing, startup and shutdown procedures for all equipment.

B. All training shall be video recorded as record for Owner.

C. Contractor shall furnish Architect five complete sets of prints, instructions and/or data covering the proper operations and maintenance of all equipment furnished under these Specifications.

D. The Contractor shall include in a loose-leaf binder the following:

1. All equipment submitted and approved under Paragraph 4A.
2. As-built drawings and hydraulic calculations with P.E. or Designer's Stamp.
3. Electronic copy of drawings.
4. Copy of valve tag charts.
5. Copy of Final System Inspection as required by City, State, and NFPA 25.
6. Copy of "Contractor's Material and a Test Certificate".
7. Material Safety Data Sheets on pipe dope, antifreeze, caulk, etc.

3.09 HAZARDOUS SUBSTANCES

A. If it is found or suspected that any existing pipe or equipment covering, building structure and/or components is found to contain asbestos, and that asbestos is to be disturbed or is found to be loose, friable or unencapsulated, it should be called to the Owner's attention. Owner will be responsible for removal or encapsulation. Contractor's attention is directed to OSHA and Wisconsin Administrative Codes regarding Asbestos Removal and it shall be this Contractor's responsibility to comply with all possible applicable provisions. See General Conditions.

3.10 RUBBISH REMOVAL

A. Remove rubbish, protection, dirt, debris, tools, equipment, and unused materials from building and site. Leave building and premises in a clean orderly condition.

3.11 GUARANTEE

A. This Contractor guarantees all work, new materials and apparatus to operate to the satisfaction of the Architect for one year from the completion and acceptance of the system and must keep same in repair for said period, unless defects are clearly the result of bad management after apparatus is out of his control. The guarantee period shall start when system has been accepted by the Architect as being in working order.

3.12 TESTS

A. Test entire new installation in compliance with NAPA and the Local Fire Department Representative and Owner's Insurance Carrier. Contractor's inspection shall be provided as per NFPA 25 on forms provided by the National Fire Sprinkler Association.

B. Provide Owner with Certification of Approval Tests and Inspection.

END OF SECTION

SECTION 22 05 00 - COMMON WORK RESULTS FOR PLUMBING

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Sleeves and Openings

B. Access Panels and Doors

C. Identification

D. Sealing and Firestopping

E. Bedding and Backfill

1.02 RELATED SECTIONS

A. Applicable provisions of Division 1 govern work under this section.

B. This section applies to all Division 22 sections of plumbing.

1.03 REFERENCES

A. ACI 614: Recommended Practice for Measuring, Mixing and Placing of Concrete.

B. ASTM D1557: Standard Test Method for Moisture-Density Relations of Soils

C. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials

D. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials

E. D.O.T.: Standard Specifications for Road and Bridge Construction, State of Wisconsin, Department of Transportation

F. UL1479: Fire Tests of Through-Penetration Firestops

G. UL723: Surface Burning Characteristics of Building Materials

1.04 SUBMITTALS

A. Refer to Division 1 – Administrative Requirements, for submittal procedures.

B. Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation.

C. Submit for all equipment and systems as indicated below and/or as identified in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and/or number, as indicated in the contract documents. List piping material type for each piping service on the project, ASTM number, schedule or pressure class, joint type, manufacturer and model number(s). List valves and specialties for each piping service, fixture and equipment with manufacturer and model number(s). Include wiring diagrams of electrically powered equipment.

D. Submit drawings to the Architect covering the following:

Water Meter	Backflow Preventers	Drains
Pumps and Controls	Gauges	Cleanouts
Valves	Insulation	Water Heating Equipment
Carriers and Drainage Fittings	Plumbing Fixtures and Trim	Thermometers
Hangers and Supports	Access Panels	Pipe Identification
Valve Tags	Pipe and Fittings	Dielectric Unions
Water Softener	Grease Trap	

E. Approval of shop drawings in no way relieves the contractor from his responsibility of providing equipment and materials or performing work as required by the Contract Drawings and Specifications or required by Code.

F. Where any specific equipment, materials, process or method of construction is specified by name or by reference to the catalog number of a manufacturer, the specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the drawings.

1.05 QUALITY ASSURANCE

A. Refer to Division 1, General Conditions, Equals and Substitutions.

B. All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.

C. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.

1.06 CONTINUITY OF EXISTING SERVICES

A. Do not interrupt or change existing services without prior written approval from the Owner's Project Representative. When interruption is required, coordinate scheduling of down-time with the Owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.

1.07 PROTECTION OF FINISHED SURFACES

A. Refer to Division 1, General Requirements, Protection of Finished Surfaces.

1.08 SLEEVES AND OPENINGS

A. Refer to Division 1, General Requirements, Sleeves and Openings.

1.09 SEALING AND FIRESTOPPING

A. Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

B. Each Contractor shall be responsible for restoring any unused penetrations where piping or equipment was removed during demolition of existing systems in fire rated walls and floors to the original and or intended rating (whichever is greater).

1.10 CONNECTIONS TO EQUIPMENT FURNISHED BY OTHERS

A. Plumbing Contractor shall make all required water and drain connections to Heating, Ventilating, and Air Conditioning Equipment, Laboratory, Kitchen, Pool Equipment and Owner's equipment requiring such connections. The Plumbing Contractor shall install all supply outlets furnished to him as well as connect all sinks and drains to the waste system with "P" traps and supply stops.

B. Piping, fittings, and shut-off valves between plumbing service outlets in floors and walls and fixtures shall be attached to pieces of equipment together with labor of connecting, shall be furnished by Plumbing Contractor. All exposed piping to be chrome-plated.

C. Plumbing Contractor shall check rough-in drawings, specifications and shop drawings for materials and work furnished by Equipment Contractor and materials and work required by Plumbing Contractor. Holes required in Owner's Equipment for pipe will be cut by Equipment Contractor.

D. Floor and hub drains and water supply for Heating, Air Conditioning, Kitchen and Owner's Equipment will be provided by this Contractor and will be located near the equipment. Heating, Air Conditioning, Kitchen, Laboratory or Pool Division of the Work shall make final water connections and extend piping to drains.

1.11 OFF-SITE STORAGE

A. Prior approval by the A/E will be needed. The contractor shall submit a Storage Agreement Form for consideration of off-site materials storage. Generally, sleeves, pipe/pipe fittings and similar rough-in material will not be accepted for off-site storage. No material will be accepted for off-site storage unless shop drawings for the material have been approved.

1.12 CODES

A. Comply with requirements of The State of Wisconsin Administrative Codes as well as all other City, County or Local ordinances.

1.13 REQUEST AND CERTIFICATION FOR PAYMENT

A. Within 10 days after Notice to Proceed, the successful bidder will submit to the Project Representative in a form prescribed below and by the General Conditions of the Contract - Scheduling and Coordination of Work, Reports, Records and Data, Payments to Contractor, a cost breakdown of the proposed values for work performed which, if approved, will become the basis for construction progress and monthly payments. The cost breakdown items shall reflect actual work progress stages as closely as feasible.

B. In addition, if payment is requested for approved off-site stored material, then that material shall be listed as a line item in the request and certification for payment cost breakdown.

1.14 CERTIFICATES AND INSPECTIONS

A. Refer also to Division 1, General Conditions, Permits, Regulations, Utilities and Taxes.

B. Obtain and pay for all required State installation inspections except those already provided by the Architect or Engineer/Designer. Deliver originals of these certificates to the Owner's Project Representative. Include copies of the certificates in the Operating and Maintenance Instruction.

1.15 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Refer to Division 1, General Requirements, Operating and Maintenance Instructions.

B. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:

1. Copies of all approved shop drawings.
2. Manufacturer's wiring diagrams for electrically powered equipment.
3. Records of tests performed to certify compliance with system requirements.
4. Parts list for fixtures, equipment, valves and specialties.
5. Manufacturers' installation, operation and maintenance recommendations for fixtures, equipment, valves and specialties.
6. Valve schedules.
7. Lubrication instructions, including list/frequency of lubrication.
8. Warranties.
9. Additional information as indicated in the technical specification sections.

1.16 TRAINING OF OWNER PERSONNEL

A. Instruct user agency personnel in the proper operation and maintenance of systems and equipment provided as part of this project. Include not less than 4 hours of instruction, using the Operating and Maintenance manuals during this instruction. Demonstrate startup, operation and shutdown procedures for all equipment. All training to be during normal working hours. Videotape all instructions and provide Owner with copy.

1.17 RECORD DRAWINGS

A. Refer to Division 1, General Requirements, Record Drawings.

PART 2 - PRODUCTS

2.01 ACCESS PANELS AND DOORS

A. LAY-IN CEILINGS: Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4 foot configuration provided under Section 09 50 00 are sufficient; no additional access provisions are required unless specifically indicated.

B. CONCEALED SPLINE CEILINGS: Removable sections of ceiling tile held in position with metal slats or tabs compatible with the ceiling system used will be provided under Section 09 50 00.

C. METAL PAN CEILINGS: Removable sections of ceiling tile held in position by a pressure fit will be provided under Section 09 50 00.

D. PLASTER OR DRYWALL WALLS AND CEILINGS: 16 gauge frame with not less than a 20 gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public or secured areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the item needing service; minimum size is 12" by 12".

2.02 IDENTIFICATION

A. STENCILS: Not less than 1 inch high letters/numbers for marking pipe and equipment.

B. ENGRAVED NAME PLATES: White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

C. SNAP-AROUND PIPE MARKERS: One-piece, preformed, vinyl construction, snap-around or strap-around pipe markers with applicable labeling and flow direction arrows, 3/4" min. size for lettering. Provide nylon ties on each end of pipe markers. Equal to Seton Setmark.

D. VALVE TAGS: Round brass tags with 1/2 inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum diameter, with brass jack chains, brass "S" hooks or one piece nylon ties around the valve stem, available from EMED Co., Seton Name Plate Company, or W. H. Brady. Provide a color coded tack in ceiling or wall where valves are located.

E. UNDERGROUND WARNING TAPE: Provide detectable underground warning tracer wire. Wire to be installed at all new exterior utility locations. Warning tape to have 5.0 mil overall thickness, 6" width, 18 gauge thick metallic core with polyethylene jacket bonded to both sides. Color code tape and print “CAUTION” along with name of buried service in bold letters on face of tape. Thor Enterprises Magnatec or equal by Carlton, MSI Marking Services, Seton. See detail on plans.

2.03 BEDDING AND BACKFILL

A. Bedding up to a point 12" inches above the top of the pipe shall be thoroughly compacted sand or crushed stone chips meeting the following gradations:

Gradation for Bedding Sand		Gradation for Crushed Stone Chip Bedding	
Sieve Size	Passing (by Wt)	Sieve Size	Passing (by Wt)
1 inch	100	1/2 inch	100
No. 16	45 - 80	No. 4	75 - 100
No. 200	2 - 10	No. 100	10 - 25

B. Backfill above the bedding in lawn areas shall be thoroughly compacted excavated material free of large stones, organic, perishable, and frozen materials.

C. Backfill above the bedding under existing and future utilities, paving, sidewalks, curbs, roads and buildings shall be granular materials, pit run sand, gravel, or crushed stone, free from large stones, organic, perishable, and frozen materials.

2.04 SEALING AND FIRESTOPPING

A. FIRE AND/OR SMOKE RATED PENETRATIONS:

1. Manufacturers: 3M, Hilti, Rectorseal, STI/SpecSeal, Tremco, or approved equal.

2. All firestopping systems shall be provided by the same manufacturer.

3. Fire stop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Safety & Professional Services.

4. Submittals: Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgment can be based upon. The contractor will be responsible for selecting the appropriate UL tested fire stop system for each application required on the project and will submit this to the A/E for review.

5. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

6. Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

B. NON-RATED PENETRATIONS

1. In wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated pipe and the cored opening or a water-stop type wall sleeve. The operating bolts of the mechanical type seal shall be accessible from the interior of the building. Equal to Link-Seal.

2. At pipe penetrations of interior partitions, floors and exterior walls, use urethane caulk in annular space between pipe insulation and sleeve.

PART 3 - EXECUTION

3.01 REMODELING AND DEMOLITION

A. Perform all demolition as indicated on the drawings to accomplish new work. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with the Owner to minimize disruption to the existing building occupants.

B. Remodeling work and alterations of existing plumbing systems in the present building shall be done at such time as directed by Architect and as may be required by the Owner and Engineer for the Building. Work shall be performed as directed so as not to interrupt the normal operation of the present building.

C. Do not interrupt or change existing services without prior written approval from the Owner or Architect. When interruption is required, coordinate scheduling of downtime with the Owner to minimize disruption to activities. Notify proper authorities when system is interrupted.

D. Location of existing equipment, valves and piping, as shown, is approximate, and such piping, valves and equipment shall be verified as to location at the site, before proceeding with work.

E. Remove existing equipment, fixtures, valves, piping, pipe hangers, pipe supports, wiring, associated conduit and similar items demolished, abandoned or deactivated. Seal all existing piping behind finished walls, floors and ceilings. Restore any unused penetrations in fire rated walls and floors to the original and or intended rating (whichever is greater). Turn over any removed fixtures, valves, piping or equipment as requested by the Owner. Remainder of piping and equipment to become property of Plumbing Contractor and shall be removed from site.

3.02 EXCAVATION AND BACKFILL

A. Perform all excavation and backfill work necessary to accomplish indicated plumbing systems installation. Excavate to bottom of pipe and structure bedding, 4" in stable soils, 6" in rock or wet trenches and 8" in unstable soil. Finish bottoms of excavations to true, level surface.

B. Remove existing concrete floor slab in neat and straight lines to the limits of removal. Make sawcut lines parallel to existing joints, or parallel or perpendicular to floor slab edges to form a neat patch. Carefully remove remaining floor slab within the sawcut area. Leave existing base materials between the area disturbed by the work and the sawcut line undisturbed by the sawcutting, floor slab removal, or floor slab replacement processes.

C. Tunnel or remove sidewalk and curb in areas of excavation to the nearest joint. Remove pavements, curbs and gutters to neat and straight lines to the limits of removal. Make sawcut lines parallel to existing joints, or parallel or perpendicular to pavement edges to form a neat patch. Carefully remove remaining pavement within the sawcut area. Leave existing base materials between the area disturbed by the work and the sawcut line undisturbed by the sawcutting, pavement removal, or pavement replacement processes.

D. Strip topsoil from area to be excavated, free from subsoil and debris, and store for later re-spreading.

E. At no time place excavated materials where they will impede surface drainage unless such drainage is being safely rerouted away from the excavation.

F. Excavate whatever materials are encountered as required to place at the elevations shown, all pipe, manholes, and other work. Remove debris and rubbish from excavations before placing bedding and backfill material.

G. Remove surplus excavated materials from site.

H. Verify the locations of any water, drainage, gas, sewer, electric, telephone or steam lines which may be encountered in the excavation. Underpin and support all lines. Cut off service connections encountered which are to be removed at the limits of the excavation and cap.

I. Provide and maintain all fencing, barricades, signs, warning lights, and/or other equipment necessary to keep all excavation pits and trenches and the entire subgrade area safe under all circumstances and at all times. No excavation shall be left unattended without adequate protection.

J. Elevations shown on the plans are subject to such revisions as may be necessary to fit field conditions. No adjustment in compensation will be made for adjustments up to two (2) feet above or below the grades indicated on the plans.

K. Install lines passing under foundations with minimum of 1-1/2 inch clearance to concrete and insure there is no disturbance of bearing soil.

L. Bed pipe up to a point 12" above the top of the pipe. Take care during bedding, compaction and backfill not to disturb or damage piping.

M. Mechanically compact bedding and backfill to prevent settlement. The initial compacted lift to not exceed 24" compacted to 95% density per Modified Proctor Test (ASTM D-1557). Subsequent lifts under pavements, curbs, walks and structures are not to exceed 12" and be compacted to 95% density per Modified Proctor Test. In all other areas where construction above the excavation is not anticipated within 2 years, mechanically compact backfill in lifts not exceeding 24" to 90% density per Modified Proctor Test. Route the equipment over each lift of the material so that the compaction equipment contacts all areas of the surface of the lift.

3.03 SHEETING, SHORING AND BRACING

A. Provide shoring, sheet piling and bracing in conformance with the Wisconsin Administrative Code to prevent earth from caving or washing into the excavation. Shore and underpin to properly support adjacent or adjoining structures. Abandon in place shoring, sheet piling and underpinning below the top of the pipe, or, if approved in advance by the engineer, maintained in place until other permanent support approved by the engineer is provided.

3.04 DEWATERING

A. Provide, operate and maintain all pumps and other equipment necessary to drain and keep all excavation pits, trenches and the entire subgrade area free from water under all circumstances. Obtain general permit from the Department of Natural Resources district office for discharge of construction dewatering effluent. Obtain well permit from the Department of Natural Resources district office for dewatering wells discharging more than 70 GPM. Comply with permit requirements.

3.05 ROCK EXCAVATION

A. Remove rock encountered in the excavation to a minimum dimension of six (6) inches outside the pipe. Rock excavation includes all hard, solid rock in ledges, bedded deposits and unstratified masses, all natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock; which material is so hard or so firmly cemented that in the opinion of the Engineer it is not practical to excavate and remove same with a power shovel except after thorough and continuous drilling and blasting. Rock excavation includes rock boulders of 1/2 cubic yard or more in volume.

B. Rock excavation will be computed on the basis of the depth of rock removed and a trench width two (2) feet larger than the outside diameter of the pipe where one (1) pipe is laid in the trench and three (3) feet larger than the combined outside diameter where two (2) pipes are laid in the trench. Include 6" pipe and structure bedding in rock excavation. Include rock excavation shown on the plans in the Base Bid.

3.06 SURFACE RESTORATION

A. Completely restore the surface of all disturbed areas to a like condition of the surface prior to the work. Level off all waste disposal areas and clean up all areas used for the storage of materials or the temporary deposit of excavated earth. Remove all surplus material, tools and equipment.

3.07 CONCRETE WORK

A. Plumbing related cast-in-place concrete on the exterior of the building to be provided by this Contractor in conformance with requirements of Division 3. This includes piping thrust restraints, pipe supports, hydrant supports, manholes, catch basins, grease traps, septic tanks, distribution boxes, valve pits, meter pits, cleanout cover pads, yard hydrant pads, etc.

3.08 CUTTING AND PATCHING

A. Refer to Division 1, General Requirements, Cutting and Patching.

3.09 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance or removal of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

3.10 EQUIPMENT ACCESS

A. Install all piping, conduit, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster walls or ceilings, furnish the access doors to the General Contractor.

3.11 COORDINATION

A. Coordinate all work with other contractors prior to installation. Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

B. Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

3.12 IDENTIFICATION

A. Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion.

B. Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

C. Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background.

D. Identify all exterior buried piping for entire length with detectable underground warning tracer wire. Place wire 6"-12" below finished grade along entire length of pipe. Extend wire to surface at building entrances, meters, hydrants and valves. Where existing underground warning tape is broken during excavation, replace with new tape identifying appropriate service and securely spliced to ends of existing wire.

E. Identify valves with brass tags bearing system identification and a valve sequence number. Identify valves with brass tags and wall or cabinet mounted color-coded engraved nameplate with the following "(Type of System) Shutoff Valve for (Room or Location)". Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.

F. Coordinate pipe identification, valve tags and valve charts with Facility Standards.

G. Match any existing system and add valve numbering to existing charts.

3.13 LUBRICATION

A. Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the work is accepted by the Owner. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

3.14 SLEEVES

A. Provide galvanized sheet metal sleeves for pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall. In existing poured concrete walls where penetration is core drilled, pipe sleeve is not required.

B. Pipe sleeves in new poured concrete construction shall be schedule 40 steel pipe, cast in place.

C. In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 3/4 inch above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

3.15 SEALING AND FIRESTOPPING

A. FIRE AND/OR SMOKE RATED PENETRATIONS:

1. Install approved product in accordance with the manufacturer's instructions where a pipe penetrates a fire/smoke rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier.

2. Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support substantial weight.

B. NON-RATED PARTITIONS:

1. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe and tighten in place, in accordance with manufacturer's instructions.

2. At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

3.16 ELECTRICAL WORK

A. All line voltage wiring shall be by the Electrical Contractor.

B. Plumbing Contractor shall furnish combination-fused switches and starters and wiring diagrams for electrical equipment furnished to the Electrical Contractor.

C. Prior to ordering any and all equipment which require electrical connections, coordinate with Division 26 for the correct horsepower and voltage at the site. The cost associated with any equipment ordered with the wrong voltage will be the responsibility of Plumbing Contractor to correct.

D. Plumbing Contractor shall be responsible for furnishing and installation of low voltage wiring and connections for equipment furnished by Plumbing Contractor, including hiring of a State Licensed Electrical Contractor for required wiring.

3.17 HAZARDOUS SUBSTANCES

A. If it is found or suspected that any existing pipe or equipment covering, building structure and/or components is found to contain asbestos, and that asbestos is to be disturbed or is found to be loose, friable or unencapsulated, it should be called to the Owner’s attention. Owner will be responsible for removal or ecapsulation. Contractor’s attention is directed to OSHA and Wisconsin Administrative Codes regarding Asbestos Removal and it shall be this Contractor’s responsibility to comply with all possible applicable provisions. See General Conditions.

3.18 COMMISSIONING OF PLUMBING SYSTEMS

A. The contractor shall verify that all plumbing systems are complete and operational. This includes but is not limited to the following:

1. Water Meter(s).
2. Water Heater(s).
3. Hot Water Circulation Pump.
4. Hot water recirculation balancing valves/system is balanced.
5. Mixing valves are set to specified temperature.
6. Gas regulators are calibrated to specified pressure and vented to the exterior.
7. Meters and gauges have been installed and are accurate.
8. All pipe and valves are identified.
9. Valve tags have been installed and properly charted.

END OF SECTION

SECTION 22 05 14 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Floor Drains

B. Hub Drains

C. Roof Drains

D. Cleanouts

E. Water Hammer Arrestors

F. Backflow Preventers

G. Hose Bibbs

H. Lambs Tongue Discharge Nozzles

I. Safings

J. Vent Flashings

1.02 RELATED SECTIONS

A. Applicable provisions of Division 1 shall govern work under this section.

B. Section 22 10 05 – Plumbing Pipe and Fittings

C. Section 22 05 23 – Plumbing Valves

1.03 REFERENCES

A. ANSI A112.14.1 Backwater Valves

B. ANSI A112.21.1 Floor Drains.

C. ANSI A112.21.2 Roof Drains.

D. ANSI A112.26.1/PDI WH-201 - Water Hammer Arrestors.

E. ASSE 1001 Pipe Applied Atmospheric Type Vacuum Breakers.

F. ASSE 1010 Water Hammer Arrestors.

G. ASSE 1011 Hose Connection Vacuum Breakers.

H. ASSE 1012 Backflow Preventers with Intermediate Atmospheric Vent.

I. ASSE 1013 Reduced Pressure Principle Backflow Preventers.

J. ASSE 1019 Wall Hydrants, Frost Proof Automatic Draining, Anti-Backflow Type.

1.04 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

C. Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 1 - General Conditions

B. Plumbing products requiring approval, must be approved or have pending approval at the time of shop drawing submission.

C. Design Concept: The Drawings indicate capacities, sizes, and dimensional requirements of system components. Components having equal performance characteristics that deviate from the indicated size and dimensions may be considered, provided deviations do not change the design concept or intended performance. The burden of proof for equality of products is on the Contractor.

1.06 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and identify with labels clearly describing contents.

B. Operating Keys (Handles): Furnish 1 extra key for each key-operated hose bibb installed.

PART 2 - PRODUCTS

2.01 FLOOR DRAINS

A. Manufacturer: Josam, Smith, Wade, Zurn, Sioux Chief, Watts.

B. Refer to Drain Schedule on drawings.

2.02 HUB DRAINS

A. Refer to Drain Schedule on drawings.

B. Assembly: ASME A112.21.2M.

2.03 ROOF DRAINS

A. Manufacturer: Josam, Smith, Wade, Zurn, Sioux Chief, Watts.

B. Refer to Drain Schedule on drawings.

2.04 CLEANOUTS

A. Manufacturer: Josam, Smith, Wade, Zurn, Sioux Chief, Watts.

B. INTERIOR CONCRETE FLOOR AREAS:

1. Enameled cast iron body with round adjustable scoriated polished nickel bronze cover, tapered threaded ABS closure plug. Zurn ZN-1400 / ZN-1400-T.

C. INTERIOR CERAMIC TILE FLOOR AREAS:

1. Enameled cast iron body with square adjustable scoriated nickel bronze cover, tapered threaded ABS closure plug. Zurn ZN-1400-T.

D. INTERIOR VINYL TILE FLOOR AREAS:

1. Enameled cast iron body with round adjustable scoriated nickel bronze cover, tapered threaded ABS closure plug. Zurn ZN-1400.

E. INTERIOR CARPETED FLOOR AREAS:

1. Enameled cast iron body with round adjustable scoriated nickel bronze cover and secured carpet marker, tapered threaded ABS closure plug. Zurn Z-1400-CM.

F. INTERIOR FINISHED WALL AREAS:

1. Line type cleanout tee with tapered threaded ABS cleanout plug, round polished stainless steel access cover secured with machine screw. Zurn Z-1446 (Note: Screw shall not pass completely through the ABS plug; trim screw as necessary)

G. INTERIOR EXPOSED VERTICAL STACKS:

1. Line type cleanout tee with tapered threaded ABS closure plug. Zurn Z-1445.

H. INTERIOR HORIZONTAL LINES:

1. Cast iron hub with tapped ferrule and tapered threaded ABS or PVC closure plug, or no-hub coupling and blind plug.

I. EXTERIOR PAVED AREAS:

1. Hub or plug with tapered threaded ABS or PVC closure plug, Schedule 40 PVC frost sleeve and cover set in 30" diameter by 4" min. thick reinforced concrete pad top or surrounding pavement, crowned for drainage. Neenah R-1974-A with non-ferrous securing screw. Refer to detail on plans.

J. EXTERIOR UNPAVED AREAS:

1. Hub or plug with tapered threaded ABS or PVC closure plug, Schedule 40 PVC frost sleeve and cover set in 30” diameter by 4” min. thick reinforced concrete pad top. Neenah R-1974-A with non-ferrous securing screw. Refer to detail on plans.

2.05 BACKWATER VALVES

A. Manufacturers: Josam 67500, J.R. Smith 7012, Sioux Chief 869-PS or Zurn Z1090.

B. Hub and spigot or No-Hub inlet and outlet body with access cover. Flapper to hang in closed position during non-operation period.

C. Provide access to backwater valve with an extension sleeve to the floor complete with Sioux Chief 850-4N cleanout cover or approved equal.

2.06 WATER HAMMER ARRESTORS

A. Manufacturer: Ancon, PPP Industries, Sioux Chief, or Watts.

B. ANSI A112.26.1, ASSE 1010; sized in accordance with PDI WH-201, precharged piston type constructed of hard drawn Type K copper, threaded brass adapter, brass piston with o-ring seals, FDA approved silicone lubricant, suitable for operation in temperature range 35 to 150 degrees F, maximum 250 psig working pressure, 1500 psig surge pressure. Watts series 15.

2.07 BACKFLOW PREVENTERS

A. Manufacturers: Ames, Beeco, Cla-Val, Conbraco, Febco, Watts, or Wilkins.

B. HOSE CONNECTION VACUUM BREAKERS:

1. ASSE 1011, brass or bronze construction, EPDM diaphragm and seat, rated for 125 psig and 180^{o}F. Watts 8 (interior application).

C. PIPE APPLIED ATMOSPHERIC TYPE VACUUM BREAKERS:

1. ASSE 1001, same size as pipe, brass or bronze construction, silicone disc, rated for 125 psig and 160^{o}F. Watts 288A.

D. ANTI-SIPHON PRESSURE TYPE VACUUM BREAKERS:

1. ASSE 1020, same size as pipe, brass or bronze construction, silicone disc, plastic seat, stainless steel spring, inlet and outlet ball shutoff valves, test port ball valves, rated for 150 psig and 110^{o}F. Watts 800M4QT

E. HIGH HAZARD ANTI-SIPHON, ANTI-SPILL VACUUM BREAKERS:

1. ASSE 1056, same size as pipe, brass or bronze construction, silicone rubber discs, stainless steel springs, inlet and outlet ball shutoff valves, with test cocks, anti-spill design, rated for 150 psig and 180 deg. F max.. Watts 008QT.

F. REDUCED PRESSURE ZONE BACKFLOW PREVENTERS:

1. ASSE 1013 reduced pressure zone backflow assembly complete with inlet strainer, inlet and outlet ball or butterfly isolation valves. Constructed of bronze or epoxy coated cast iron body with bronze and plastic internal parts, stainless steel springs, non-threaded vent outlet, 4 test cocks, rated for 175 psig and 210^{o}F, with air gap apparatus on drain. Watts series LF909-S-QT. Refer to detail on plans.

2.08 HOSE BIBBS

A. Manufacturer: Josam, Smith, Wade, Woodford, or Zurn.

B. Refer to Fixture Schedule on drawings.

2.09 LAMBS TONGUE DISCHARGE NOZZLE

A. Manufacturers: Josam, Smith, Wade, Watts, Zurn.

B. Cast nickel bronze downspout nozzle with anchor flange, countersunk mounting holes and stainless steel bird screen. Watts RD-940-83.

2.10 VALVE BOXES

A. Manufacturers: C.P. Test Service, Mueller, Tyler.

B. Two-piece cast iron adjustable height casing with cast iron frame, cast iron cover and bottom bearing flange. Size for full burial depth of valve. 2" minimum internal diameter for valves sizes through 2", 4" minimum internal diameter for valve sizes 2-1/2" through 3" and 5-1/4" minimum diameter for 4" and larger valves. Cast name of service on cover top. On plastic pipelines, provide cast iron foot piece matched to valve box bottom or concrete bearing pad for support of valve.

2.11 SAFINGS

A. Manufacturers: Noble, Oatey.

B. Chlorinated polyethylene sheeting, 40 mils thick, ASTM D4068, with CPE solvent; or 3 lb./sq.ft. sheet lead.

2.12 VENT FLASHINGS

A. Manufacturers: Semco, Oatey.

B. Formed 3 lb./sq.ft. lead flashing with minimum base size of 15"x17".

C. Single Ply Membrane Roofs: Flashing boot of material compatible with roofing membrane with base flange for adhering to membrane and stainless steel drawband for securing to vent pipe.

D. Refer to detail on plans.

2.13 HOSE-END DRAIN VALVES

A. 3/4 inch ball valve, rated for 400 PSIG WOG. Include 2 piece bronze body conforming to ASTM B62, standard port, chrome-plated brass ball, replaceable “TFE” seats and seals, blowout-proof stem, and vinyl-covered steel handle.

1. Inlet: Threaded.

2. Outlet: Short-threaded nipple with ASME B1.20.7 garden hose thread and cap.

3. Hose-End, Drain Valve Option: MSS SP-80, gate valve, Class 125, ASTM B62 body, with 3/4 inch threaded inlet and ASME B1.20.7 garden hose thread outlet and cap. Hose bibbs are prohibited for this application.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Coordinate location and setting of plumbing specialties with adjacent construction. Install in accordance with manufacturer recommendations.

B. Set floor drains, roof drains, trench drains and cleanouts level and plumb adjusted to finished floor elevation, roof elevation or finished wall location. Locate where serviceable. Allow minimum of 18" clearance around cleanouts for rodding. Lubricate threaded cleanout plugs with graphite and oil, Teflon tape or waterproof grease. Install trap primer connections where required. Provide deep seal traps on floor drains.

C. Set backwater valves on undisturbed soil or compacted granular backfill, level and plumb with top adjusted to finished floor elevation. Test and adjust valve for proper operation. Allow minimum 18" clearance for servicing.

D. Install water hammer arrestors where indicated and at quick closing valve installations.

E. Install backflow preventers in accordance with Wisconsin Department of Safety and Professional Services requirements maintaining minimum clearance distances for servicing and testing. Provide indirect waste piping with air gap installation from relief opening to above hub drain or floor drain.

F. Where backflow preventers requiring State registration are installed, initial registration has been completed by the Engineer/Designer. Initial testing and report filing as required is the responsibility of this contractor. Furnish to Owner required information for future testing to be performed by Owner after First Year Maintenance Agreement expires.

G. Mount wall hydrants recessed in exterior wall construction with valve plug extended beyond interior side of building insulation. Slope to drain to exterior. Install so discharge is 18” min. above finished grade. Set wall box in grout or caulk and fill exterior wall penetration with insulation.

H. Mount hose bibbs securely fastened to wall where indicated. Provide water hammer arrestor in line to hose bibb.

I. Excavate for underground structures (manholes, catch basins, tanks, etc.) setting precast bases on granular backfill and pouring cast-in-place bases on undisturbed soil. Seal joints between base, sections, collars and castings with gasketing material for tightly packed waterproof seals. Adjust casting to match finished grade. Form interior shelves with concrete grout for smooth flowlines conforming to the shape and slope of the sewer. Place piping into structures providing full support of piping on exterior bedding and insuring pipe seals are properly installed and waterproof. Valve manholes and other manholes intended to remain dry must be made waterproof and are subject to infiltration testing. Where an entering sewer is 2 feet or more above the springline of a leaving sewer, provide outside drop connection encased in concrete. Where existing pipe penetrations are being removed or capped, fill opening with non-shrink portland cement grout plug. Backfill and compact soil around structure.

J. Install safing at floor drains above grade. Extend 12" beyond drains in all directions. Cover entire floor in showers and extend 6" up in walls above curbs and to a height of 6' (3" wide each direction) in corners. Install on concrete floor that is smooth and free of debris. Seal all joints and connect to drain body clamp. Safing is subject to standing water leak test.

K. Flash vent penetrations through roof. Provide waterproof prefabricated pipe seal boot with stainless steel clamping ring in elastomeric mastic. Seal edges with weather-proof sealant. Refer to detail on drawings.

L. Supply Runouts to Fixtures: Install hot and cold water supply piping runouts to fixtures of sizes indicated, but not smaller than required by plumbing code.

M. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but not smaller than required by Plumbing Code.

N. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

O. Electrical Connections: Power wiring and disconnect switches are specified in Division 26.

1. Grounding: Connect unit components to ground according to the National Electrical Code and Division 26 Section “Grounding.”

P. Protect drains during duration of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

Q. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION

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SECTION 22 05 23 - PLUMBING VALVES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Water System Valves
   1. Ball Valves
   2. Butterfly Valves
   3. Swing Check Valves
   4. Spring Loaded Check Valves
   5. Stop & Waste Valves
   6. Balancing Valves
   7. Drain Valves

B. Natural Gas Systems
   1. Shut-off Valves
   2. Gas Pressure Regulators

1.02 RELATED SECTIONS

A. Applicable provisions of Division 1 govern work under this section.

B. Section 22 05 14 - Plumbing Specialties

C. Section 22 30 00 - Plumbing Equipment

1.03 REFERENCES

A. ANSI Z21.22 Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.

1.04 SUBMITTALS

A. Schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 1 - General Conditions

1.06 DESIGN CRITERIA

A. Where valve types (ball, butterfly, etc.) are specified for individual plumbing services (i.e. domestic water, gas, etc.), each valve type shall be of the same manufacturer.

B. Valves to be line size.

PART 2 - PRODUCTS

2.01 WATER SYSTEM VALVES

A. All water system valves to be rated at not less than 125 water working pressure at 240 degrees F unless noted otherwise.

B. BALL VALVES:

1. 3" and smaller: Two or three piece bronze body; sweat ends, chrome plated bronze ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 600 psig WOG. Provide valve stem extensions for valves installed in piping with vapor barrier type insulation. Apollo 70-200, Grinnell 3700, Hammond 8511, Milwaukee BA150, Nibco S580-70, Watts B-6001.

C. BUTTERFLY VALVES:

1. 2-1/2" and larger:
   a. Cast or ductile iron body; stainless steel shaft; bronze, copper or teflon bushings; EPDM resilient seat; EPDM seals; bronze, aluminum-bronze, EPDM encapsulated ductile iron or stainless steel disc. 200 psig WOG through 12", 150 psig WOG through 24". Valve assembly to be bubble tight to 175 psig with no downstream flange/pipe attached. Use tapped lug type valves with stud bolts or cap screws, or grooved end connection valves, permitting removal of downstream piping while using the valve for system shutoff. Centerline LT series, DeZurik 632, Grinnell Series 8000, Hammond 6200 Series, Milwaukee M or C Series, Nibco LD2000/LC2860, Victaulic Series 608N (Copper) or Series 461 (Stainless Steel), Watts BF-03.

D. SWING CHECK VALVE:

1. 3" and smaller: Bronze body, sweat ends, Y-pattern, regrindable bronze seat, renewable bronze disc, Class 125, suitable for installation in a horizontal or vertical line with flow upward. Crane 1342, Grinnell 3300SJ, Hammond IB941, Nibco S413B, Watts CVYS.

2. 4" and larger: Cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, Class 125, non-asbestos gasket, suitable for installation in a horizontal or vertical line with flow upward. Crane 373, Grinnell 6300A, Hammond IR1124, Milwaukee F2974, Nibco F918B, Watts Series 411.

E. SPRING LOADED CHECK VALVES:

1. 2" and smaller: Bronze body, sweat or threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, Class 125, teflon seat unless only bronze available. ConBraCo 61 series, Grinnell 3600SJ, Mueller 203BP, Nibco S480Y, Victaulic Series 716.

2. 2-1/2" and larger: Cast or ductile iron body, wafer or globe type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required, Class 125. APCO 300 or 600 series, Centerline CLC with full body option, Hammond IR9354, Milwaukee 1800 series, Mueller Steam 101AP or 105AP, Nibco W910 or F910, Val-Matic 1400 or 1800 or 8000 series.

F. STOP & WASTE VALVES:

1. 1” and smaller, Bronze body, sweat or threaded ends, 400 psi WOG, stainless steel ball and stem, full port ball valve, with threaded drain cap, Watts B-6300/6301 SS series. Apollo, Grinnell, Hammond, Milwaukee or Nibco manufacturer.

G. BALANCE VALVES:

1. Suitable for 125 PSIG water working pressure at 240° F. Flowset Accusetter, Armstrong CBV, Bell & Gosset Circuit Setter, Victaulic/TA Hydronics.

H. DRAIN VALVES:

1. 3/4 inch ball valve with integral threaded hose adapter, sweat or threaded inlet connections, with threaded cap and chain on hose threads, Watts B-6000-CC/B-6001-CC series.

2.02 NATURAL GAS SYSTEMS

A. SHUT-OFF VALVES:

1. 4" and smaller: Ball or eccentric plug valve, bronze or cast iron body, 2" and under threaded ends, 2-1/2" and over flanged ends, chrome plated bronze ball, bronze or nickel plated cast iron plug, TFE or Hycar seats and seals, lever handle, 175 psi W.O.G., U.L listed for use as natural gas shut-off. Apollo 80-100, DeZurik 425.

2. 5" and larger: Cast iron body, flanged ends, stainless steel bearings, resilient faced plugs, totally enclosed hand wheel actuators, 175 psi W.O.G., U.L. listed for use as natural gas shut-off.

B. GAS PRESSURE REGULATORS:

1. Gas pressure regulators shall be as manufactured by Equimeter, Fisher, Maxitrol, or approved equal.

2. 2" and smaller: Cast iron body, aluminum spring and diaphragm, Nitrile diaphragm, threaded ends, 150 psi W.O.G., -20 degrees F to 150 degrees F.

3. Regulators shall be ANSI Z21.18 or ANSI Z21.18a, single stage, steel jacketed, corrosion-resistant pressure regulators. Include atmospheric vent, elevation compensator, with threaded ends for 2 inches and smaller and flanged ends for 2½ inches and larger.

4. Regulator pressure ratings, inlet and outlet pressures, and flow volume in standard cubic feet per hour of natural gas at specific gravity are as indicated:

   a. Maxitrol 325 Series (2psig/5psig) Line Gas Pressure Regulators: Inlet pressure rating not less than system pressure.

   b. Maxitrol RV Series (less than 2psig) Appliance Gas Pressure Regulators: Inlet pressure rating not less than system pressure, with capacity and pressure setting matching appliance.

5. Gas Pressure Regulator Vents: Shall be factory or field installed corrosion-resistant screen in opening.

6. Flexible Connectors: Shall be ANSI Z21.24 or ANSI Z21.24a, copper alloy.

PART 3 - EXECUTION

3.01 GENERAL

A. Properly align piping before installation of valves. Install and test valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

B. Mount valves in locations which allow access for operation, servicing and replacement.

A. Where supply piping is installed in walls or hard-surface ceilings, shut-off valves shall be concealed. Provide an access panel.

C. Install all valves with the stem in the upright or horizontal position. If possible, install butterfly valves with the stem in the horizontal position. Valves installed with the stems down will not be accepted.

D. Prior to flushing of piping systems, place all valves in the full-open position.

3.02 SHUT-OFF VALVES

A. Install shut-off valves at each piece of equipment, at each branch take-off from mains for isolation or repair and elsewhere as indicated.

3.03 BALANCING VALVES

A. Install where indicated on the drawings and details for balancing of pumped systems.

B. Upon project completion, adjust each valve and set position stop. Balance system to minimum flow in return piping branches needed to maintain even supply water temperature throughout building.

C. Contractor shall be responsible for balancing the hot Water Circulating Return System and shall provide Certification that the system has been balanced, noting G.P.M. flow through each balancing valve installed and its operating position. This certification shall be included in the Owner's Operating Manual.

3.04 DRAIN VALVES

A. Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, downstream of riser isolation valves, equipment locations specified or detailed, other locations required for drainage of systems and elsewhere as indicated.

3.05 SPRING LOADED CHECK VALVES

A. Install a spring loaded check valve in each circulating pump discharge line, each clearwater sump pump discharge line and elsewhere as indicated.

3.06 SWING CHECK VALVES

A. Install swing check valves in recirculation branch lines and elsewhere as indicated.

3.07 PRESSURE REDUCING VALVES

A. Provide ball valve and strainer at inlet and ball valve at outlet. Install pressure gauges to indicate inlet and outlet pressure at each pressure reducing valve.

3.08 GAS PRESSURE REGULATORS

A. When a gas pressure regulator is equipped with a vent connection, run a connection size vent to exterior of the building in full accordance with codes. Use a larger size vent when required by the manufacturer's installation instructions. Terminate vents with turned-down, reducing elbow fittings with corrosion-resistant insect screens in large end.

B. Verify & calibrate correct pressure settings for pressure regulators after installation of all gas-fired equipment for the building has been installed and is operational.

C. Comply with NFPA 54 “Prevention of Accidental Ignition.”

D. Install a gas valve upstream and downstream of each gas pressure regulator. Where two gas pressure regulators are installed in series in a single gas line, a manual valve is not required at the second regulator.

3.09 GAS VALVE INSTALLATION

A. Use gas valves for shutoff to appliances. Install a gas valve upstream and within 6 feet of gas utilizing appliance and no higher than 6’-0’’ off finished floor. Install a union or flanged connection downstream from the valve to permit removal of controls.

B. Use gas valves of size indicated for gas service piping, meters, mains, and where indicated.

C. Install valves in accessible locations, protected from physical damage. Tag valves with a metal tag attached w/ a metal chain indicating the piping system.

END OF SECTION

SECTION 22 05 29 - PLUMBING SUPPORTS AND ANCHORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural Supports

B. Pipe Hangers and Supports

C. Beam Clamps

D. Riser Clamps

E. Concrete Inserts

F. Continuous Concrete Insert Channels

G. Anchors

H. Equipment Stands

I. Roof Mounted Pipe Support

J. Corrosive Atmosphere Coatings

1.02 RELATED SECTIONS

A. Applicable provisions of Division 1 shall govern work under this section.

B. Division 1 - Concrete formwork and cast-in-place concrete for equipment pads.

C. Section 22 07 00 - Plumbing Insulation for insulation protection at support devices.

1.03 REFERENCES

A. MSS SP-58

B. MSS SP-69

1.04 SUBMITTALS

A. Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service.

1.05 QUALITY ASSURANCE

A. Refer to Division 1, General Conditions, Equals and Substitutions.

1.06 DESCRIPTION

A. Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for building piping.

B. Do not hang any mechanical item directly from a metal deck or run piping so its rests on the bottom chord of any truss or joist.

C. Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.

D. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

E. Protect insulation at all hanger points; see Related Work above.

1.07 DESIGN CRITERIA

A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

B. Piping connected to pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. B-Line, Grinnell, Pate, Piping Technology, Roof Products & Systems or approved equal.

2.02 STRUCTURAL SUPPORTS

A. Provide all supporting steel required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the drawings.

2.03 PIPE HANGERS AND SUPPORTS

A. HANGERS FOR PIPE SIZES 1/2" THROUGH 2":

1. Carbon steel, adjustable swivel ring. B-Line B3170NF, Grinnell 69 or 70.

2. Carbon steel, adjustable clevis, standard. B-Line B3100, Grinnell 260.

B. HANGERS FOR PIPE SIZES 2" AND LARGER:

1. Carbon steel, adjustable clevis, standard. B-Line B3100, Grinnell 260.

C. MULTIPLE OR TRAPEZE HANGERS:

1. Steel channels with welded spacers and hanger rods.

D. WALL SUPPORT:

1. Carbon steel welded bracket with hanger. B-Line 3068 Series, Grinnell 194 Series.

2. Perforated, epoxy painted finish, 16-12 gauge, min., steel channels securely anchored to wall structure, with interlocking, split-type, bolt secured, galvanized pipe/tubing clamps. B-Line type S channel with B-2000 series clamps, Grinnell type PS 200 H with PS 1200 clamps. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Grinnell PS 1400 series.

E. VERTICAL SUPPORT:

1. Carbon steel riser clamp. B-Line B3373, Grinnell 261 for above floor use. Grinnell 40 with bolts and concrete anchors for attachment to underside of concrete floor deck.

F. FLOOR SUPPORT:

1. Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.

G. COPPER PIPE SUPPORTS:

1. All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or polyvinylchloride coated. Where steel channels are used, provide isolation collar between supports/clamps/fasteners and copper piping.

2.04 PIPE HANGER RODS

A. STEEL HANGER RODS:

1. Threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts.

2. Size rods for individual hangers and trapeze support as indicated in the detail on the plans.

2.05 BEAM CLAMPS

A. MSS SP-69 Types 19 & 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick with a retaining ring and threaded rod of 3/8, 1/2, and 5/8 inch diameter. Furnish with a hardened steel cup point set screw. B-Line B3036L/B3034, Grinnell 86/92.

B. MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2 inch diameter. B-Line B3054, Grinnell 228.

2.06 CONCRETE INSERTS

A. POURED IN PLACE:

1. MSS SP-69 Type 18 wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity. B-Line B2505, Grinnell 281.

2. MSS SP-69 Type 18 universal type to be constructed of black malleable iron body with a removeable malleable iron nut that accepts threaded rod to 7/8 inch diameter. B-Line B3014N, Grinnell 282.

B. DRILLED FASTENERS:

1. Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

2.07 CONTINUOUS CONCRETE INSERT CHANNELS

A. Steel inserts with an industry standard pre-galvanized finish, nominally 1-5/8 inch wide by 1-3/8 inch deep by length to suit the application, designed to be nailed to concrete forms and provide a linear slot for attaching other support devices. Installed channels to provide a load rating of 2000 pounds per foot in concrete. Manufacturer's standard brackets, inserts, and accessories designed to be used with the channel inserts may be used. Select insert length to accommodate all pipe in the area.

2.08 ANCHORS

A. Use welding steel shapes, plates, and bars to secure piping to the structure.

2.09 EQUIPMENT STANDS

A. Use structural steel members welded to and supported by pipe supports. Clean, prime and coat with three coat rust inhibiting alkyd paint or one coat epoxy mastic. Where exposed to weather, treat with corrosive atmosphere coatings.

2.10 ROOF MOUNTED PIPE ROLLER SUPPORT

A. Minimum height of support to be 14" above roof deck.

B. Constructed of not less than 18 gauge galvanized steel reinforced so it is structurally capable of supporting the intended load with no penetrations through the curb flashing, inside and outside corner sections that are mitered and continuously welded, filled with 3 pound density insulation, integral deck mounting flange, nominal two inch wood nailer, galvanized steel counterflashing with attached galvanized steel channel track for securing pipe roller and roller support. Do not use built-in metal base flashings or cants.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Size, apply and install supports and anchors in compliance with manufacturers recommendations.

B. Install supports to provide for free expansion of the piping system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

C. Coordinate hanger and support installation to properly group piping of all trades.

D. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior approval.

E. Size and install hangers and supports, except for riser clamps, for installation on the exterior of piping insulation. Where a vapor barrier is not required, hangers may be installed either on the exterior of pipe insulation or directly on piping.

F. Perform welding in accordance with standards of the American Welding Society.

3.02 HANGER AND SUPPORT SPACING

A. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.

B. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

C. Use hangers with 1-1/2 inch minimum vertical adjustment.

D. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

E. Support riser piping independently of connected horizontal piping.

F. Adjust hangers to obtain the slope specified in the piping section of these specifications.

G. Space hangers for pipe as per Typical Pipe Support Detail on plans.

3.03 RISER CLAMPS

A. Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor.

3.04 CONCRETE INSERTS AND CONTINUOUS INSERT CHANNELS

A. Select size based on the manufacturer's stated load capacity and weight of material that will be supported. Locate continuous insert channels on 6'-0" maximum centers and 2'-0" from corners. Furnish inserts to the General Contractor for placement in concrete formwork. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch size. Where concrete slabs form finished ceiling, provide inserts that are flush with the slab surface.

3.05 ANCHORS

A. Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.06 ROOF MOUNTED PIPE ROLLER SUPPORT

A. Secure bottom of support flat on roof deck. Apply two coats of zinc rich paint to cut edges of all galvanized steel elements. Flashing and counterflashing by the General Contractor.

END OF SECTION

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SECTION 22 07 00 - PLUMBING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Materials

B. Insulation & Jackets

C. Fire Barrier Wrap

D. Accessories

1.02 RELATED WORK

A. Applicable provisions of Division 1 govern work under this section.

B. Section 22 05 00 - Common Work Results for Plumbing (Pipe Penetrations)

C. Section 22 10 05 – Plumbing Pipe and Fittings

D. Section 22 05 29 – Plumbing Supports and Anchors

E. Section 22 30 00 - Plumbing Equipment

1.03 REFERENCES

A. ASTM B209 Aluminum and Aluminum Alloy Sheet and Plate

B. ASTM C165 Test Method for Compressive Properties of Thermal Insulations

C. ASTM C177 Heat Flux and Thermal Transmission Properties

D. ASTM C195 Mineral Fiber Thermal Insulation Cement

E. ASTM C240 Cellular Glass Insulation Block

F. ASTM C302 Density of Preformed Pipe Insulation

G. ASTM C303 Density of Preformed Block Insulation

H. ASTM C449 Mineral Fiber Hydraulic Setting Thermal Insulation Cement

I. ASTM C518 Heat Flux and Thermal Transmission Properties

J. ASTM C533 Calcium Silicate Block and Pipe Thermal Insulation

K. ASTM C534 Preformed Flexible Elastomeric Thermal Insulation

L. ASTM C547 Mineral Fiber Preformed Pipe Insulation

M. ASTM C552 Cellular Glass Block and Pipe Thermal Insulation

N. ASTM C553 Mineral Fiber Blanket and Felt Insulation

O. ASTM C578 Preformed, Block Type Cellular Polystyrene Thermal Insulation

P. ASTM C591 Preformed Rigid Cellular Polyurethane Thermal Insulation

Q. ASTM C610 Expanded Perlite Block and Thermal Pipe Insulation

R. ASTM C612 Mineral Fiber Block and Board Thermal Insulation

S. ASTM C921 Properties of Jacketing Materials for Thermal Insulation

T. ASTM C1136 Flexible Low Permeance Vapor Retarders for Thermal Insulation

U. ASTM E84 Surface Burning Characteristics of Building Materials

V. MICA National Commercial & Industrial Insulation Standards

W. NFPA 225 Surface Burning Characteristics of Building Materials

X. NFPA 262 Standard Method of Test for Fire and Smoke Characteristics

Y. UL 723 Surface Burning Characteristics of Building Materials

Z. UL 910 Safety Test for Flame-Propagation and Smoke-Density Values

1.04 SUBMITTALS

A. Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, fitting materials along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 1 - General Conditions of the Contract.

B. Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

1.06 DESCRIPTION

A. Furnish and install all insulating materials and accessories as specified or as required for a complete installation. The following types of insulation are specified in this section:

1. Pipe Insulation

2. Equipment Insulation

B. Install all insulation in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the Project Representative.

1.07 DEFINITIONS

A. Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Materials or accessories containing asbestos will not be accepted.

B. Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:

1. Insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke developed rating no higher than 150.

2.02 INSULATION AND JACKETS

A. Manufacturers: Armacell, Certainteed Manson, Childers, Dow, Extol, Halstead, H.B. Fuller, Imcoa, Knauf, Owens-Corning, Pittsburgh Corning, Rubatex, Schuller, or approved equal.

B. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.

C. RIGID FIBERGLASS INSULATION:

1. Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 degrees F.

2. White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

D. SEMI-RIGID FIBERGLASS INSULATION:

1. Minimum nominal density of 3 lbs. per cu. ft., thermal conductivity of not more than 0.28 at 75 degrees F, minimum compressive strength of 125 PSF at 10% deformation, rated for service to 450 degrees F. Insulation fibers perpendicular to jacket and scored for wrapping cylindrical surfaces.

2. White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

E. CALCIUM SILICATE INSULATION:

1. Rigid hydrous calcium silicate, ASTM C533, Type I, minimum dry density of 12.5 lbs. per cu. ft., thermal conductivity of not more than 0.44 at 300 degrees F, maximum water absorption of 90% by volume, minimum compressive strength 140 psi at 5% deformation, rated for service range of 0 degrees F to 1,200 degrees F. Material to be visually coded or marked to indicate it is asbestos free.

F. ELASTOMERIC INSULATION:

1. Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than 0.27 at 75 degrees F, minimum compressive strength of 4.5 psi at 25% deformation, maximum water vapor transmission of 0.17 perm inch, maximum water absorption of 6% by weight, rated for service range of -20 degrees F to 220 degrees F on piping and 180 degrees F where adhered to equipment.

G. POLYOLEFIN INSULATION:

1. Flexible closed cell, minimum nominal density of 1.5 lbs. per cu. ft., thermal conductivity of not more than 0.24 at 75 degrees F, minimum compressive strength of 5 psi at 25% deformation, maximum water vapor transmission of 0.0 perm inch, maximum water absorption of 0% by weight and volume, rated for service range of -165 degrees F to 210 degrees F.

H. PHENOLIC INSULATION:

1. Rigid closed cell, minimum nominal density of 2.2 lbs. per cu. ft., thermal conductivity of not more than 0.13 at 75 degrees F, minimum compressive strength of 31 psi parallel and 18 psi perpendicular, maximum water vapor transmission 0.117 perm inch, maximum water absorption of .5% by volume, rated for service range of -290 degrees F to 250 degrees F.

2. Kraft reinforced foil vapor barrier laminate all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

I. EXTRUDED POLYSTYRENE INSULATION:

1. Rigid closed cell, minimum nominal density of 2.2 lbs. per cu. ft., thermal conductivity of not more than 0.2 at 75 degrees F, minimum compressive strength of 35 psi, maximum water vapor transmission of 1.1 perm inch, maximum water absorption of .1% by volume, rated for service range of -290 degrees F to 165 degrees F.

J. URETHANE INSULATION:

1. Rigid closed cell polyisocyanurate, minimum nominal density of 1.8 lbs. per cu. ft., thermal conductivity of not more than 0.19 at 75 degrees F aged 180 days, minimum compressive strength of 19 psi parrallel and 10 psi perpendicular, maximum water vapor transmission of 4 perm inch, maximum water absorption of .2% by volume, rated for service range of -290 degrees F to 300 degrees F.

K. CELLULAR GLASS INSULATION:

1. Rigid closed cell, minimum nominal density of 8.5 lbs. per cu. ft., thermal conductivity of not more than 0.36 at 50 degrees F, minimum compressive strength of 100 psi, maximum water vapor transmission of 0.0 perm inch, maximum water absorption of .2% by volume, rated for service range of -450 degrees F to 900 degrees F.

L. FIREPROOFING INSULATION:

1. Mineral fiber with nominal density of 8 lbs. per cu. ft., flame spread index of 15, fuel contribution index of 0, and smoke developed index of 0, thermal conductivity of not more than 0.23 at 75 degrees F.

2. Jacket material shall be the same as jacket for adjacent insulation.

M. PVC FITTING COVERS AND JACKETS:

1. White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be .02 inch (20 mil).

N. METAL JACKETS:

1. .016 inch thick aluminum or .010 inch thick stainless steel with safety edge.

2.03 INSULATION INSERTS AND PIPE SHIELDS

A. Manufacturers: B-Line, Pipe Shields, Value Engineered Products

B. Construct inserts with calcium silicate, minimum 140 psi compressive strength. Piping 12” and larger, supplement with high density 600 psi structural calcium silicate insert. Provide galvanized steel shield. Insert and shield to be minimum 180 degree coverage on bottom of supported piping and full 360 degree coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide additional load distribution steel plate.

C. Where contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thicknesses, gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered.pre-manufactured product described above. On low temperature systems, extruded polystyrene may be substituted for calcium silicate provided insert and shield length and gauge are increased to compensate for lower insulation compressive strength.

D. Precompressed 20# density molded fiberglass blocks, Hamfab or equal, of same thickness as adjacent insulation may be substituted for calcium silicate inserts with one 1”x 6” block for piping through 2-1/2” and three 1” x 6” blocks for piping through 4”. Submit shield schedule to demonstrate equivalency to pre-engineered/pre-manufactured product described above.

E. Wood blocks will not be accepted.

2.04 FIRE BARRIER WRAP

A. Thermal Ceramics Firemaster PlenumWrap, 3M Fire Barrier Plenum Wrap 5A or equal.

B. High temperature, inorganic fiber blanket encapsulated with aluminum foil specifically tested and approved by the State for plastic pipe from external flame propagation and smoke generation in return air plenums. Product shall meet or exceed testing standards set by NFPA 262 and UL 910.

2.05 ACCESSORIES

A. All products shall be compatible with surfaces and materials on which they are applied, and be suitable for use at operating temperatures of the systems to which they are applied.

B. Adhesives, sealants, and protective finishes shall be as recommended by insulation or wrap manufacturer for applications specified.

C. Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel. Minimum thickness to be 0.015 inch for aluminum and .010 inch for stainless steel.

D. Fire barrier wrap bands to be a minimum of 1/2 inch wide, constructed of carbon steel or stainless steel. Minimum thickness to be 0.015.

E. Tack fasteners to be stainless steel ring grooved shank tacks.

F. Staples to be clinch style.

G. Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.

H. Finishing cement to be ASTM C449.

I. Insulation fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.

J. Bedding compounds to be non-shrinking and permanently flexible.

K. Vapor barrier coatings to be non-flammable, fire resistant, polymeric resin.

L. Fungicidal water base coating (Foster 40-20 or equal) to be compatible with vapor barrier coating.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install insulation, jackets, wraps and accessories in accordance with manufacturer's instructions and under ambient temperatures and conditions recommended by manufacturer. Surfaces to be insulated must be clean and dry.

B. Do not insulate or wrap systems or equipment which are specified to be pressure tested or inspected, until testing, inspection and any necessary repairs have been successfully completed.

C. Install insulation and wraps with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Cover and seal exposed fiberglass insulation when insulation is terminated, no raw fiberglass insulation is allowed. Provide neat and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation or wrap terminates. Install with longitudinal joints facing wall or ceiling.

D. Seal off raw ends of insulation and butt joints with vapor barrier mastic at intervals of not more than 20 feet on piping requiring a vapor barrier.

E. Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.

F. Use full-length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.

G. Insulation and wrap shall be continuous through sleeves and openings. Vapor barriers shall be maintained continuous through all penetrations.

H. Provide a complete vapor barrier for insulation on the following systems:

1. Cold water

2. Storm Water

3. Equipment with a surface temperature below 65 degrees F.

3.02 PIPING, VALVE, AND FITTING INSULATION

A. GENERAL:

1. Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2” lap on jacket seams and 2” tape on butt joints, firmly cemented with lap adhesive. Additionally secure with staples along seams and butt joints. Coat staples with vapor barrier mastic on systems requiring vapor barrier.

2. Water supply piping insulation shall be continuous throughout the building and installed adjacent to and within building walls to a point directly behind the fixture that is being supplied.

3. Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation. Where a vapor barrier is not required, hangers and supports may be attached directly to piping with insulation completely covering hanger or support and jacket sealed at support rod penetration. Where riser clamps are required to be attached directly to piping requiring vapor barrier, extend insulation and vapor barrier jacketing/coating around riser clamp.

B. INSULATION INSERTS AND PIPE SHIELDS:

1. Provide insulation inserts and pipe shields at all hanger and support locations. Inserts may be omitted on 3/4” and smaller copper piping provided 12” long 22 gauge pipe shields are used.

C. FITTINGS AND VALVES:

1. Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built up insulation of the same thickness as adjoining insulation. Cover insulation with fabric reinforcing and mastic or where temperatures do not exceed 150 degrees, PVC fitting covers. Secure PVC fitting covers with tack fasteners and 1-1/2” band of mastic over ends, throat, seams or penetrations. On systems requiring vapor barrier, use vapor barrier mastic.

D. ELASTOMERIC AND POLYOLEFIN:

1. Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation. For elastomeric insulation, apply full bed of adhesive to both surfaces. For polyeolefin, seal factory preglued seams with roller and field seams and joints with full bed of hot melt polyolefin glue to both surfaces.

E. PROTECTIVE JACKETS:

1. All exposed piping and valves located in the following locations, must be covered with a PVC jacket: Cafeterias, Equipment Rooms, Shower and Locker Rooms, Boiler Rooms, Dishwashing Rooms and Kitchens.

2. Lap seams a minimum of 2 inches. Secure with metal bands for end joints, and rivets or sheet metal screws for longitudinal joints. Rivets, screws, and bands to be constructed of the same material as the jacket. Locate seams on bottom for exterior applications.

F. PIPE INSULATION SCHEDULE:

1. Provide insulation on new and existing remodeled piping as indicated in the following schedule:

Service	Insulation Types	Insulation Thickness by Pipe Size				
		1" and smaller	1-1/4" to 2"	2-1/2" to 4"	5" to 6"	8" and larger
Hot Water Supply	Rigid Fiberglass	1"	1"	1"	1.5"	1.5"
Hot Water Circulating	Rigid Fiberglass	1”	1”	1”	1.5”	1.5”
Cold Water	Rigid Fiberglass	0.5”	0.5”	1”	1”	1”
Non-Potable Cold Water	Rigid Fiberglass	0.5”	0.5”	1”	1”	1”
Non-Potable Hot Water	Rigid Fiberglass	0.5”	0.5”	1”	1”	1”
Horizontal Storm & Roof Drain Bodies	Rigid Fiberglass	0.5"	0.5"	0.5"	0.5"	0.5"

2. The following piping and fittings are not to be insulated:
   - Chrome plated exposed supplies and stops (except where specifically noted).
   - Water hammer arrestors.
   - Tempering/Mixing Valves.
   - Piping unions and flanges for systems not requiring a vapor barrier.

G. EXISTING INSULATION:

1. Repair damage to existing insulation disturbed by new work.

3.03 EQUIPMENT INSULATION

A. Do not insulate over equipment access manholes, fittings, nameplates or ASME stamps. Bevel and seal insulation at these locations.

B. SEMI-RIGID FIBERGLASS:

1. Apply insulation to equipment shells using weld pins, bonding adhesive, banded and wired in place. Fill all joints, seams and depressions with insulating cement to a smooth, even surface. Cover with reinforcing fabric and 2 coats of mastic. . Use vapor barrier mastic on systems requiring a vapor barrier.

C. ELASTOMERIC/POLYOLEFIN:

1. Apply full cover coat of adhesive to surface to be insulated, insulation and edge butt joints. Place insulation with edge joints firmly butted pressing to surface for full adhesion. Seal seams and joints vapor tight.

3.04 FIRE BARRIER WRAP

A. PVC plastic pipe used in plenum spaces shall be wrapped with code approved fire wrap material per manufacture's recommendations or enclosed within ½ inch Type X Gypsum Wallboard.

B. Cut and fit fire barrier wrap to a length sufficient to cover completely around the perimeter of the pipe with a minimum overlap of 1-inch.

C. Seal cut edges of the blanket with a minimum 3/4 inch wide aluminum foil tape to ensure no exposed fiber.

D. Butt ends of wrap shall be overlapped by a minimum of 1 inch.

E. Install banding 1/4 inch from each edge and at the midpoint of the blanket. Tension banding to hold blanket snugly in place without cutting the foil. If foil ripping occurs, seal the rip with aluminum foil tape overlapping the rip in all directions by a minimum of 3/4 inch.

END OF SECTION

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SECTION 22 10 05 - PLUMBING PIPE AND FITTINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Domestic Water

B. Sanitary Waste and Vent

C. Storm and Clear Water Waste

D. Natural Gas

E. Dielectric Unions and Flanges

F. Unions and Flanges

G. Mechanical Grooved Pipe Connections

1.02 RELATED SECTIONS

A. Applicable provisions of Division 1 govern work under this section.

B. Section 22 05 29 – Plumbing Supports and Anchors

C. Section 22 05 14 - Plumbing Specialties

1.03 REFERENCES

A. ANSI A21.4

B. ANSI A21.11

C. ANSI A21.51

D. ANSI B16.3 Malleable Iron Threaded Fittings

E. ANSI B16.4 Cast Iron Threaded Fittings

F. ANSI B16.5 Pipe Flanges and Flanged Fittings

G. ANSI B16.22 Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings

H. ANSI B16.29 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings DWV

I. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

J. ASTM A74 Cast Iron Soil Pipe and Fittings

K. ASTM A105 Forgings, Carbon Steel, for Piping Components

L. ASTM A126 Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings

M. ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

N. ASTM A861 High Silicon Iron Pipe and Fittings

O. ASTM A888 Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications

P. ASTM B32 Solder Metal

Q. ASTM B88 Seamless Copper Water Tube

R. ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

S. ASTM B306 Copper Drainage Tube (DWV)

T. ASTM B813 Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube

U. ASTM B819 Seamless Copper Tube for Medical Gas Systems

V. ASTM C76 Reinforced Concrete Culvert, Storm Drain and Sanitary Pipe

W. ASTM C443 Joints for Circular Concrete Pipe Sewer and Culvert Pipe Using Rubber Gaskets

X. ASTM C564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings

Y. ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe

Z. ASTM D2321 Underground Installation of Flexible Thermoplastic Sewer Pipe

AA. ASTM D2241 Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)

BB. ASTM D2464 Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80

CC. ASTM D2466 Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40

DD. ASTM D2513 Thermoplastic Gas Pressure Pipe, Tubing, and Fittings

EE. ASTM D2564 Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings

FF. ASTM D2665 Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings

GG. ASTM D2729 Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

HH. ASTM D2774 Recommended Practice for Underground Installation of Thermoplastic Pressure Piping

II. ASTM D2855 Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings

JJ. ASTM D3034 Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings

KK. ASTM D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

LL. ASTM D3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

MM. ASTM D3311 Drain, Waste and Vent (DWV) Plastic Fitting Patterns

NN. ASTM D4101 Propylene Plastic Injection and Extrusion Materials

OO. ASTM F405 Corrugated Polyethylene (PE) Tubing and Fittings

PP. AWS A5.8 Brazing Filler Metal

QQ. AWWA C104 Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water

RR. AWWA C105 Polyethylene Encasement for Ductile Iron Piping for Water

SS. AWWA C110 Ductile Iron and Gray Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids

TT. AWWA C111 Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings

UU. AWWA C151 Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids

VV. AWWA C153 Ductile Iron Compact Fittings, 3 In. Through 48 In., for Water and Other Liquids

WW. AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances

XX. AWWA C651 Disinfecting Water Mains

YY. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution

ZZ. CISPI 310 Couplings For Use In Connection With Hubless Cast Iron Soil Pipe And Fittings For Sanitary And Storm Drain, Waste And Vent Piping Applications

AAA. NFPA 54 National Fuel Gas Code

1.04 SUBMITTALS

A. Schedule from the contractor indicating the ASTM, AWWA or CISPI specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.

B. Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, AWWA or CISPI specification contained in this section.

1.05 QUALITY ASSURANCE

A. Order all copper, cast iron, steel, PVC and polyethylene pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

C. Manufacturer's: Firms regularly engaged in the manufacture of pipe, tube and fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

D. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

D. Storage and protection methods must allow inspection to verify products.

1.07 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, AWWA or CISPI specifications as listed in this specification.

B. Construct all piping for the highest pressures and temperatures in the respective system.

C. PVC plastic pipe used in Plenum space shall be wrapped with code approved fire wrap material or enclosed within ½ inch Type X Gypsum Wallboard. All PVC piping to be installed per all code requirements.

D. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

E. Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

F. Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at Contractor's option.

1.08 WELDER QUALIFICATIONS

A. Welding procedures, welders, and welding operators for all building service piping to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for Piping and Tubing. Before any metallic welding is performed, Contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of ASME B31.9 Building Services Piping.

B. Before any plastic fusion welding is performed, Contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures in accordance with the Code of Federal Regulations, Title 49, Part 192, Section 192.285.

C. The Architect or Engineer reserves the right to test the work of any welder employed on the project, at the Welder’s expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project and all defective welds replaced.

PART 2 - PRODUCTS

2.01 DOMESTIC WATER

A. ABOVE GROUND:

1. Type L copper water tube, H (drawn) temper, ASTM B88; wrought copper pressure fittings, ANSI B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosporous brazing alloy, AWS A5.8 BCuP. Copper mechanical grooved fittings and couplings on roll grooved pipe may be used in lieu of soldered fittings for sizes 3-inch and larger.

2. Stainless Steel Pipe: ASTM A312, Type 304/304L, Schedule 10S, with plain ends for use with the Vic-Press piping system. Fittings shall be precision, cold drawn, stainless steel with elastomer O-ring seals, suitable for working pressure to 500-psig (3450-kPa). Victaulic Vic-Press for Schedule 10S pipe.

3. Stainless Steel Pipe: ASTM A312, Type 316/316L Seamless, Schedule 10, with plain ends for use with butt-weld fittings. Fittings shall be precision, cold drawn, stainless steel, ASTM A403, B-336.

4. Ductile iron pipe, thickness Class 53, AWWA C151/C115; with standard thickness cement mortar lining, AWWA C104; ductile iron mechanical grooved cement mortar lined fittings and couplings on cut grooved pipe, Class 350 12" and below, Class 250 above 12", AWWA C606; ductile iron or gray iron flanged cement mortar lined fittings, Class 250, AWWA C110; rubber gasket joints with non-toxic gasket lubricant, AWWA C111.

B. BELOW GROUND 2-1/2" AND SMALLER:

1. Type K copper water tube, O (annealed) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; or cast copper flared pressure fittings, ANSI B16.26.

2. High density cross-linked polyethylene manufactured in accordance with ASTM F876/F877 and CSA B137.5 as listed by NSF, CSA or equivalent testing organization. Tubing shall be rated to 160 PSI at 73°F. 100 PSI at 180°F and 80 PSI at 200°F. Tubing shall be suitable for direct bury. The minimum bend radius for cold bending of the tube shall not be less the eight (8) times the outside diameter.

C. BELOW GROUND 3" AND LARGER:

1. Ductile iron pipe, mechanical or push on joint, thickness Class 52, AWWA C151; with standard thickness cement mortar lining, AWWA C104; ductile iron or gray iron mechanical joint cement mortar lined fittings, Class 250, AWWA C110; ductile iron mechanical joint compact fittings, Class 350, AWWA C153; rubber gasket joints with non-toxic gasket lubricant, AWWA C111. Provide 8 mil tube or sheet polyethylene encasement of iron pipe and pipe fittings, AWWA C105.

2. PVC pressure pipe, DR 18, Class 150, AWWA C900 and C905; with integral bell and elastomeric gaskets, ASTM D3139. Fittings and fitting polyethylene encasement to be same as noted above for ductile iron.

D. THRUST RESTRAINTS:

1. 2500 psi concrete; retainer glands; restrained joint fittings; steel rods, ASTM A575; steel clamps and straps, ASTM A506; steel bolts, ASTM A307; malleable iron rod couplings, ASTM A197; cast iron washers, ASTM A307; bitumastic anti-corrosion coating.

E. GROUNDING:

1. No portion of the water distribution system (above or below grade) shall be used for grounding of any electrical systems.

2.02 SANITARY WASTE AND VENT

A. INTERIOR ABOVE GROUND:

1. Hubless cast iron soil pipe and fittings, ASTM A888; with no-hub couplings, CISPI 310 or CISPI 301, latest issue shall apply. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2. Type M copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP.

3. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

B. PRESSURIZED INTERIOR ABOVE GROUND:

1. Type L copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813.

C. INTERIOR AND EXTERIOR BELOW GROUND:

1. Cast iron soil pipe and fittings, hub and spigot, service weight, ASTM A74; with neoprene rubber compression gaskets, ASTM C564 and CISPI HSN 85, latest issue shall apply. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

D. EXTERIOR BELOW GROUND:

1. Cast iron soil pipe and fittings, ASTM A74; with neoprene rubber compression gaskets, ASTM C564 and CISPI HSN 85, latest issue shall apply. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

3. Type PSM PVC sewer pipe and socket fittings, SDR 35, Class 12454-B (PVC 1120), ASTM D3034; primer, ASTM F656; solvent cement, ASTM 2564; or integral bell and flexible elastomeric seal, ASTM D3212.

2.03 STORM, OVERFLOW AND CLEARWATER WASTE

A. INTERIOR ABOVE GROUND:

1. Hubless cast iron soil pipe and fittings, ASTM A888; with no-hub couplings, CISPI 310 or CISPI 301, latest issue shall apply. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2. Type M copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP.

3. Copper drainage tube (DWV), ASTM B306; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; copper phosphorous brazing alloy, AWS A5.8 BCuP.

4. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

B. INTERIOR BELOW GROUND 15" AND SMALLER:

1. Cast iron soil pipe and fittings, hub and spigot, service weight, ASTM A74; with neoprene rubber compression gaskets, ASTM C564 and CISPI HSN 85, latest issue shall apply. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564. Installation shall conform to all Codes and ASTM D2321.

E. EXTERIOR BELOW GROUND:

1. Cast iron soil pipe and fittings, hub and spigot, service weight, ASTM A74; with neoprene compression rubber gaskets, ASTM C564 and CISPI HSN 85, latest issue shall apply. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International.

2. PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM 2564. Installation shall conform to all Codes and ASTM D2321.

3. Type PSM PVC sewer pipe and fittings, SDR 35, Class 12454-B (PVC 1120), ASTM D3034; primer, ASTM F656; solvent cement, ASTM 2564; or integral bell and flexible elastomeric seal, ASTM D3212.

F. EXTERIOR BELOW GROUND 10" AND SMALLER:

1. Non-reinforced concrete sewer, storm drain and culvert pipe, Class III, ASTM C14; rubber gasket joints, ASTM C443; bell and spigot or tongue and groove ends.

G. EXTERIOR BELOW GROUND 12" AND LARGER:

1. Reinforced concrete culvert, storm drain and sewer pipe, Class III, ASTM C76; rubber gasket joints, ASTM C443; bell and spigot or tongue and groove ends.

2.04 NATURAL AND LP GAS

A. ABOVE GROUND 2" AND SMALLER:

1. Black steel pipe, Schedule 40, Type F, Grade A, ASTM A53; with black malleable iron threaded fittings, Class 150, ASTM A197/ANSI B16.3; seamless carbon steel weld fittings, standard weight, ASTM A234 grade WPB/ANSI B16.9.

B. ABOVE GROUND 2-1/2" AND LARGER:

1. Black steel pipe, Schedule 40, type F, Grade A, ASTM A53; with seamless carbon steel weld fittings, ASTM A234 grade WPB/ANSI B16.9.

C. ABOVE GROUND (HIGH PRESSURE, WELDED):

1. Black steel pipe, Schedule 40 Seamless, Type S, Grade A, ASTM A53; Class 150, ASTM A197/ANSI B16.3; seamless carbon steel weld fittings, standard weight, ASTM A234 grade WPB/ANSI B16.9.

D. BELOW GROUND:

1. Thermoplastic polyethylene gas pressure pipe, tubing and fittings, PE 2406/3406/3408, SDR 11.5 maximum, ASTM D2513; with butt-weld ASTM D3261 or socket-type polyethylene heat fusion fittings.

2.05 DIELECTRIC UNIONS AND FLANGES

A. Watts Regulator Company, Lochinvar, Wilkins or EPCO Sales, Inc., dielectric unions 2" and smaller; dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets, having a pressure rating of not less than 175 psig at 180 degrees.

2.06 UNIONS AND FLANGES

A. Unions, flanges and gasket materials to have a pressure rating of not less than 150 psig at 180 degrees.

B. 2" AND SMALLER STEEL:

1. ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping.

C. 2" AND SMALLER COPPER:

1. ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.

D. 2-1/2" AND LARGER STEEL:

1. ASTM A181 or A105, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern on black steel and threaded only on galvanized steel. Use raised face flanges ANSI B16.5 for mating with other raised face flanges or equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for mating with other flat face flanges on equipment.

E. 2-1/2" AND LARGER COPPER:

1. ANSI B15.24 Class 150 cast bronze flanges with full face gaskets.

2.07 MECHANICAL GROOVED PIPE CONNECTIONS

A. Mechanical grooved pipe couplings and fittings, ASTM F1476, as manufactured by Victaulic, ITT Grinnell or Gustin-Bacon may be used with cut groove galvanized steel pipe, cut groove ductile iron pipe or roll groove copper pipe where noted. Mechanical grooved components and assemblies to be rated for minimum 250 psi working pressure. Basis of Design: Victaulic Style 607H (Quick-Vic™). Installation ready rigid coupling for direct stab installation without field disassembly.

B. All mechanical grooved pipe material including gaskets, couplings, fittings and flange adapters to be from the same manufacturer.

C. Couplings to be malleable iron, ASTM A47, or ductile iron ASTM A536 with painted finish. Reducing couplings are not acceptable.

D. Fittings used on galvanized steel pipe to be malleable iron, ASTM A47, or ductile iron A536, with galvanized finish, ASTM A153. Fittings used on ductile iron pipe to be cement mortar lined ductile iron with coal tar coating, ASTM A536; conforming to requirements of AWWA C110/C153 and AWWA C606. Fittings used on copper pipe to be copper.

E. Installation-Ready™ fittings for grooved end copper tubing shall be manufactured to copper-tube dimensions. Fittings shall be ductile iron conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, complete with PVDF (Poly Vinylidene Fluoride) and Grade “EHP” EPDM-HP [Grade ‘T’ Nitrile] gasket; and ASTM A449 electroplated steel bolts and nuts. System shall be rated to 300 psi (2065 kPa) with Type K or L Copper Tubing.

F. Gaskets to be EPDM, ASTM D2000. Gaskets for hot water systems and dry pipe systems to be flush seal design. Heat treated carbon steel oval neck track bolts and nuts, ASTM A183, with zinc electroplated finish ASTM B633.

G. Flange adapters to be ductile iron, ASTM A536; except at lug type butterfly valves where standard threaded flanges shall be used.

H. Credit for the inherent flexibility of mechanical grooved pipe connections when used for expansion joints or flexible connectors may be allowed upon specific application by the Contractor. Three flexible couplings at first three connection points both upstream and downstream of pumps may be used in lieu of flexible connectors. Request for expansion joints shall be made in writing and shall include service, location, line size, proposed application and supporting calculations for the intended service.

PART 3 - EXECUTION

3.01 GENERAL

A. Install pipe and fittings in accordance with reference standards, manufacturers recommendations and recognized industry practices.

3.02 PREPARATION

A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 ERECTION

A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. A steel striker barrier not less than 0.0508 of an inch (approx.. 16 ga.) thick, or equivalent, shall be installed between all tubing and the finished wall and extend not less than 4 inches beyond concealed penetrations of plates, firestops, wall studs, and similar construction features. The tubing shall be installed in single runs and shall not be rigidly secured.

C. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

D. Install detectable underground warning tracer wire at all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace. See detail on plans and refer to Section 22 05 00 – Common Work Results for Plumbing.

E. Maintain piping in clean condition internally during construction.

F. Provide clearance for installation of insulation, access to valves and piping specialties.

G. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

H. Do not route piping through transformer vaults or above transformers, Electric Rooms, Computer Rooms, Elevator Equipment Rooms, Kitchens, Food Preparation/Processing Spaces, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment. Install drip pans under piping that must be routed through these spaces.

I. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

J. PVC piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings unless installed per all code requirements. PVC plastic pipe used in plenum spaces shall be wrapped with code approved fire wrap material or enclosed with ½ inch Type X Gypsum Wallboard.

K. PVC piping shall not be installed for any drains serving areas where waste temperatures are 140° F or higher. This includes, but is not limited to, Kitchen, Laundry and Mechanical spaces.

L. All PVC piping to be installed per all Code Requirements.

3.04 COPPER PIPE JOINTS

A. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

3.05 WELDED PIPE JOINTS

A. Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (1/2) the diameter of the main.

3.06 THREADED PIPE JOINTS

A. Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.07 SOLVENT WELDED PIPE JOINTS

A. Install in accordance with ASTM D2855 "Making Solvent Cemented Joints With PVC Pipe and Fittings". Saw cut piping square and smooth. Tube cutters may be used if they are fitted with wheels designed for use with PVC/CPVC pipe that do not leave a raised bead on pipe exterior. Support and restrain pipe during cutting to prevent nicks and scratches. Bevel ends 10-15 degrees and deburr interior. Remove dust, drips, moisture, grease and other superfluous materials from pipe interior and exterior. Check dry fit of pipe and fittings. Reject materials which are out of round or do not fit within close tolerance. Use heavy body solvent cement for large diameter fittings.

B. Maintain pipe, fittings, primer and cement between 40 and 100 degrees during application and curing. Apply primer and solvent using separate daubers (3" and smaller piping only) or clean natural bristle brushes about 1/2 the size of the pipe diameter. Apply primer to the fitting socket and pipe surface with a scrubbing motion. Check for penetration and reapply as needed to dissolve surface to a depth of 4-5 thousandths. Apply solvent cement to the fitting socket and pipe in an amount greater than needed to fill any gap. While both surfaces are wet, insert pipe into socket fitting with a quarter turn to the bottom of the socket. Solvent cement application and insertion must be completed in less than 1 minute. Minimum of 2 installers is required on piping 4" and larger. Hold joint for 30 seconds or until set. Reference manufacturers recommendations for initial set time before handling and for full curing time before pressure testing. Cold weather solvent/cement may be utilized only under unusual circumstances and when specifically approved by the Project Representative.

3.08 MECHANICAL HUBLESS PIPE CONNECTIONS

A. Place the gasket on the end of one pipe or fitting and the clamp assembly on the end of the other pipe or fitting. Firmly seat the pipe or fitting ends against the integrally molded shoulder inside the neoprene gasket. Slide the clamp assembly into position over the gasket. Tighten fasteners to manufacturers recommended torque.

3.09 MECHANICAL JOINT PIPE CONNECTIONS

A. Comply with AWWA C600/C605 installation requirements. Clean pipe end and socket. Clean and lubricate pipe end, socket and gasket with soapy water or gasket lubricant. Place gland and gasket, properly oriented, on pipe end. Insert pipe end fully into socket and press gasket evenly into recess keeping joint straight. Press gland evenly against gasket, insert bolts and hand tighten nuts. Make joint deflection prior to tightening bolts. Evenly tighten bolts in sequence to recommended torque.

3.10 PUSH-ON GASKETED PIPE CONNECTIONS

A. Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Ensure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

3.11 MECHANICAL GROOVED PIPE CONNECTIONS

A. Use pipe factory grooved in accordance with the coupling manufacturer's specifications or field grooved pipe in accordance with the same specifications using specially designed tools specially designed for the application. Lubricate pipe and coupling gasket, align pipe, and secure joint in accordance with the coupling manufacturer's specifications.

3.12 DOMESTIC WATER

A. Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.

B. Install exterior water piping below predicted frost level in accordance with code requirements, but in no case less than 6' bury depth to top of pipe. Maintain minimum of 8' horizontal distance between 2-1/2" and larger water piping and sanitary sewer piping. Maintain minimum of 30" horizontal and 12" vertical distance, water on top, between 2" and smaller water piping and sanitary sewer piping. Where water piping crosses a sanitary sewer, provide minimum 18" vertical clearance and waterproof PVC water pipe sleeve (reference sanitary sewer materials) sealed at both ends for distance of 10' from sewer in both directions.

C. Provide thrust restraints for 3" and larger exterior water piping joints, hydrants, caps, plugs, fittings and bends of 22-1/2 degrees or more. Pour concrete thrust blocks against compacted or undisturbed soil. Where soil bearing capacity is less than 2000 psf or adjacent construction may affect soil bearing capacity, use both concrete thrust blocks and strapped/rodded restraints or restrained joints. Field apply continuous anti-corrosion coating to strapped and rodded restraint components. Protect mechanical joints, nuts and bolts from concrete cover.

D. Install interior water piping with drain valves where indicated and at low points of system to allow complete drainage. Install shutoff valves where indicated and at the base of risers to allow isolation of portions of system for repair. Do not install water piping within exterior walls.

E. Prior to use, isolate and fill system with potable water. Allow to stand 24 hours. Flush each outlet proceeding from the service entrance to the furthest outlet for minimum of 1 minute and until water appears clear. Fill system with a solution of water and chlorine containing at least 50 parts per million of chlorine and allow to stand for 24 hours. Alternately a solution containing at least 200 parts per million of chlorine may be used and allowed to stand for 4 hours. Flush system with potable water until chlorine concentration is no higher than source water level.

F. Wait 24 hours after final flushing. Take samples of water for lab testing. The number and location of samples shall be representative of the system size and configuration and are subject to approval by Engineer. Test shall show the absence of coliform bacteria. If test fails, repeat disinfection and testing procedures until no coliform bacteria are detected. Submit test report indicating date and time of test along with test results.

3.13 SANITARY WASTE AND VENT

A. Verify invert elevations and building elevations prior to installation. Install exterior piping pitched to drain at indicated elevations and slope. Install interior piping 2’’ or smaller pitched at minimum slope of 1/4" per foot and in no case less than 1/8" per foot for piping 3" and larger.

B. Install exterior piping below predicted frost level and not less than 5' bury depth to top of pipe wherever possible. Where piping is located above predicted frost level, provide frost protection in accordance with code requirements and detail on plans.

C. Flush piping inlets (floor drains, hub drains, mop basins, fixtures, etc.) with high flow of water at completion of project to demonstrate full flow capacity. Remove blockages and make necessary repairs where flow is found to be impeded.

3.14 STORM AND CLEARWATER WASTE

A. Verify invert elevations and building elevations prior to installation. Install exterior piping pitched to drain at indicated elevations and slope. Install interior piping pitched to drain at minimum slope of 1/8" per foot where possible and in no case less than 1/16" per foot for piping 3" and larger.

B. Install exterior piping below predicted frost level and not less than 5' bury depth to top of pipe wherever possible. Where piping is located above predicted frost level, provide frost protection in accordance with detail on plans.

3.15 NATURAL GAS

A. Install in accordance with NFPA 54 and 58. Pitch horizontal piping down 1" in 60 feet in the direction of flow. Install a 4" minimum depth dirt leg at the bottom of each vertical run and at each appliance. When installing mains and branches, cap gas tight each tee or pipe end which will not be immediately extended. All branch connections to the main shall be from the top or side of the main.

B. Interior gas piping installed below grade shall be installed in a containment sleeve and vented to exterior of the building. Refer to detail on plans.

C. Bury exterior underground piping a minimum of 24" below grade.

D. If an above ground vent terminates in an area subject to snow accumulation, terminate the line at least five feet above grade.

E. All joints in underground polyethylene gas pipe must be made by qualified personnel proficient in the joining methods of ASTM D2513 thermoplastic gas pressure pipe and polyethylene fittings. Do not install polyethylene gas pipe inside buildings.

F. Install a shut off valve at each appliance. Provide a valved connection at the main for equipment and appliances furnished by others.

G. Piping through a roof shall be run through an approved roof penetration with flashing and counter flashing.

H. Each gas pressure reducing valve vent and relief valve vent shall be run separately to a point outside of the building, terminated with a screened vent cap, and located according to gas utility regulations.

3.16 UNDERGROUND PIPE WRAP

A. Use for steel piping encased in concrete or underground which is not in a conduit. Remove all dirt and other foreign material from exterior of pipe. Apply primer as recommended by the manufacturer. Use a spiral wrap process for applying tape to the pipe. Repair any breaks in the tape coating caused by the installation process.

3.17 DIELECTRIC UNIONS AND FLANGES

A. Install dielectric unions or flanges at each point where a copper-to-steel pipe connection is required in domestic water systems.

3.18 UNIONS AND FLANGES

A. Install a union or flange at each connection to each piece of equipment and at other items which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

3.19 PIPING SYSTEM LEAK TESTS

A. Isolate or remove components from system which are not rated for test pressure. Perform final testing for medical and lab gas with all system components in place. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

B. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

C. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

D. For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

E. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

F. All pressure tests are to be documented and forms to be provided by the contractor.

H. Below Ground Domestic Water test pressure of 200 psig is required by NFPA 24 for private fire service mains. Small diameter piping not serving hydrants or buildings with fire protection systems may be tested at 150 psig.

END OF SECTION

SECTION 22 10 06 - PLUMBING PIPING SPECIALTIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Thermometers

B. Thermometer Sockets

C. Test Wells

D. Test Plugs

E. Pressure Gauges

F. Strainers

1.02 RELATED SECTIONS

A. Applicable provisions of Division 1 govern work under this section.

B. Section 22 10 05 – Plumbing Pipe and Fittings

C. Section 22 05 23 – Plumbing Valves

D. Section 22 07 00 - Plumbing Insulation

E. Section 22 30 00 - Plumbing Equipment

1.03 REFERENCES

A. ASTM B650 Electrodeposited Engineering Chromium Coatings on Ferrous Substrates

1.04 SUBMITTALS

A. Required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

B. Submit index for shop drawings and a cover sheet listing all components for each piece of equipment or fixture.

1.05 DESIGN CRITERIA

A. All piping specialties are to be rated for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

PART 2 - PRODUCTS

2.01 THERMOMETERS

A. Ashcroft, Marsh, Taylor, H. O. Trerice, U. S. Gauge, Weiss, Weksler.

B. Stem Type: Cast aluminum case, nine inch scale, clear acrylic window. adjustable angle brass stem with stem of sufficient length so the end of the stem is near the middle of a pipe without reducing the thickness of any insulation, red indicating fluid, black lettering against a white background, with scale ranges as follows:

Service	Hot Water, Circulating Return
Scale Range, ^{o}F	30 - 180
Increment, ^{o}F	2

2.02 THERMOMETER SOCKETS

A. Brass with threaded connections suitable for thermometer stems and temperature control sensing elements in pipeline. Furnish with extension necks for insulated piping systems.

2.03 TEST WELLS

A. Similar to thermometer sockets except with a brass cap that threads into the inside of the test well to prevent dirt from accumulating. Secure cap to body with a short chain. Furnish with extension necks, where appropriate, to accommodate the pipeline insulation.

2.04 TEST PLUGS

A. Brass threaded pressure and temperature test plug with neoprene self-closing valve, valve retainer, brass threaded cap, rated for 150 psi and 0-200 degrees F.

2.05 PRESSURE GAUGES

A. Ametek/U. S. Gauge Division, Ashcroft, Marsh, Taylor, H. O. Trerice, Weiss, Weksler.

B. Cast aluminum case of not less than 4.5 inches in diameter, double strength glass window, black lettering on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from the front of the dial, 99% accuracy over the middle half of the scale, 98.5% accuracy over the remainder of the scale, with scale range as follows:

Service	Hot Water	Cold Water
Scale Range, psig	0-100	0-100
Increment, psig	1	1

C. Pressure Snubbers: Bronze construction, 300 psig working pressure, 1/4" size.

D. Gauge Valves: Use ball valves as specified in Section 22 05 23 – Plumbing Valves.

2.06 STRAINERS

A. Armstrong, Illinois, Keckley, Metraflex, Mueller Steam, Sarco, Watts.

B. Y type; cast bronze body, ASTM B62; 20 mesh stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; sweat, threaded or flanged body rated at not less than 150 psi WOG.

C. Y type; cast iron body, ASTM A126; 20 mesh stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; threaded or flanged ends; rated at not less than 150 psi WOG.

PART 3 - EXECUTION

3.01 THERMOMETERS

A. Stem Type: Install in piping systems as indicated on the drawings and/or details using a separable socket in each location.

3.02 THERMOMETER SOCKETS

A. Install at each point where a thermometer or temperature control sensing element is located in a pipeline.

3.03 TEST WELLS

A. Install in piping systems as indicated on the drawings and/or details wherever provisions are needed for inserting a thermometer at a later date.

3.04 TEST PLUGS

A. Install in piping systems as indicated on the drawings and/or details wherever provisions are needed for short-term measurement of pressure or temperature.

3.05 PRESSURE GAUGES

A. Install in locations where indicated on the drawings and/or details, with scale range appropriate to the system operating pressures.

B. Pressure Snubbers: Install in gauge piping for all gauges used on water services.

C. Gauge Valves: Install at each gauge location as close to the main as possible and at each location where a gauge tapping is indicated.

3.06 STRAINERS

A. Install all strainers where indicated allowing sufficient space for the screens to be removed. Install a ball valve in the tapped screen retainer.

END OF SECTION

SECTION 22 30 00 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

A. Water Heaters

B. Pumps

C. Controls

D. Water Meter

1.02 RELATED SECTIONS

A. Section 22 05 23 – Plumbing Valves

B. Section 22 10 06 – Plumbing Piping Specialties

C. Section 22 07 00 - Plumbing Insulation

D. Division 26- Electrical

1.03 REFERENCES

A. Applicable provisions of Division 1 shall govern work under this section.

1.04 SUBMITTALS

A. Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, pump curves with net positive suction head requirements, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 1 - General Conditions

B. Plumbing products requiring approval, must be approved or have pending approval at the time of shop drawing submission.

PART 2 - PRODUCTS

2.01 WATER HEATING EQUIPMENT

A. Manufacturers: A.O. Smith, Bock, Bradford White, Camus, HTP, PVI, Rheem/Ruud, State.

B. Refer to Domestic Water Heater, Expansion Tank and Pump Schedules on drawings.

1. Type: Electric, storage type heater.

2. Tank shall be steel glass lined rated for 150 psig complete with powered anodes. All internal surfaces of the heater exposed to water shall be glass-lined.

3. Water heater shall have an electronic control with LCD screen displaying current status; provide real time element status and sensing, low water cut-off and an economy mode operation. It shall house a 120 volt control circuit transformer, transformer fusing, magnetic contactors, element fusing per N.E.C. and commercial grade elements with prewired terminal leads.

4. Immersion Heaters/heating elements shall be U.L. listed.

5. At water heater, furnish and install T & P relief valve with drain to within 6” of floor or drain pan, valved and unioned connections, and a dial type combination temperature/pressure gauge. Insulation to meet or exceed ASHRAE 90.1b-1992 and ASHRAE/IESNA 90.1-2004. All connections to be brass.

6. Heater tank shall have a minimum three (3) year commercial warranty.

7. Circulating pump: Bell and Gossett model as noted in Schedule or equal Grundfos. Pump to be controlled by on/off switch.

C. Furnish and install thermometers in the outlet line form the water heaters and in all hot water circulating return lines.

D. Water heater installation to be per manufacturer’s recommendation. Provide full-illustrated Instruction Manual for each heater type.

2.02 WATER METER

A. To be furnished by Plumbing Contractor. Meter to be Badger Compound Recordal Meter or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Install plumbing equipment where indicated in accordance with manufacturer's recommendations. Coordinate equipment location with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. Locate equipment and arrange plumbing piping to provide access space for servicing all components.

B. Connect equipment to water and drain piping using unions or flanges and isolation valves.

C. Startup and test equipment adjusting operating and safety controls for proper operation.

D. Where piping connections are dissimilar metals, make connections with dielectric fittings or dielectric unions.

E. Coordinate with Division 26 for Electrical requirements at site and specific locations of receptacle, starters, power connection points, etc.

3.02 WATER HEATER

A. Set water heater and expansion tank on concrete housekeeping pads. Adjust and level equipment.

B. Furnish and install thermometers in the outlet line form each water heater and in all hot water circulating return lines.

C. Water heater installation to be per manufacturer’s recommendation. Provide full-illustrated Instruction Manual for each heater type.

D. Pipe temperature and pressure relief valves to within 6” of floor.

3.03 WATER METER

A. Install pressure gauge on water service piping. Refer to detail on plans for location.

B. Plumbing Contractor to install Water Meter per Water Department requirements and pay all charges.

C. Water Meter installation to be by Plumbing Contractor as per Local Utility requirements.

D. Water Meter remote readout registration: Provide meter mounted transmitter, connecting wires, weather-proof outdoor totalizing wall unit for visual reading.

END OF SECTION

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SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Plumbing Fixtures

1.02 RELATED WORK

A. Applicable provisions of Division 1 shall govern work under this section.

B. Section 11 40 00 - Foodservice Equipment

C. Section 22 10 05 – Plumbing Pipe and Fittings

D. Section 22 05 29 – Plumbing Supports and Anchors

E. Section 22 05 14 - Plumbing Specialties

1.03 REFERENCES

A. ANSI A112.6.1M-88	Off-the Floor Plumbing Fixtures Supports for Public Use.
B. ANSI A112.18.1-94	Finished and Rough Brass Plumbing Fixture Fittings.
C. ANSI A112.19.1-90	Enameled Cast Iron Plumbing Fixtures.
D. ANSI A112.19.2M-82	Vitreous China Plumbing Fixtures.
E. ANSI A112.19.5-79(R1990)	Trim for Water Closet Bowls, Tanks and Urinals.
F. ANSI Z124.2-87	Plastic Shower Receptors and Shower Stalls.
G. ARI-1010-94	Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
H. ASSE 1011-93	Hose Connection Vacuum Breakers.
I. ASSE 1014-90	Handheld Showers.

1.04 SUBMITTALS

A. Include data concerning sizes, utility sizes, rough in-dimensions, capacities, materials of construction, ratings, weights, trim, finishes, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.05 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 1, General Conditions, Equals and Substitutions.

B. Plumbing products requiring approval, must be approved or have pending approval at the time of shop drawing submission.

PART 2 - PRODUCTS

2.01 PLUMBING FIXTURES

A. Manufacturers: Fixture descriptions establish fixture type, quality, materials, features and size. Products of the following manufacturers determined to be equal by the Architect/Engineer will be accepted.

1. Water Closets, Urinals and Lavatories: American Standard, Kohler, Sloan, Zurn.
2. Water Closet Seats: American Standard, Bemis, Kohler, Olsonite, Sloan, Zurn.
3. Faucets: American Standard, Chicago Faucet, Kohler, Sloan, Symmons, T&S Brass, Zurn.
4. Drains: Chicago Faucet, Engineered Brass Co., Kohler, McGuire, T&S Brass.
5. Stops and Supplies: Chicago Faucet Co., McGuire, T&S Brass.
6. Flush Valves: Chicago, Kohler, Sloan, Zurn.
7. Traps: Dearborn, Engineered Brass Co, Kohler, McGuire, T&S Brass. (17 gauge Min.)
8. Carriers and Supports: Josam, Smith, Wade, Watts Drainage, Zurn.
9. Washfountains: Acorn, Bradley, Sloan, Zurn.
10. Sinks: American Standard, Elkay, Just, Kindred, Kohler.
11. Mop Basins: Acorn, Fiat, Mustee, Stern-Williams.
12. Shower: Leonard, Powers, Speakman, Symmons.
13. Molded Tub and Shower Units: Aker, Aqua Glass, Fiat, Kohler, Lasco.
14. Electric Water Coolers: Acorn, Elkay, Halsey Taylor, Haws, Filtrine, Oasis.

B. Refer to Fixture Schedule on drawings for fixture type, description, and accessories.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install plumbing fixtures in accordance with manufacturer's instructions. Set level and plumb. Secure in place to counters, floors and walls providing solid bearing and secure mounting. Bolt fixture carriers to floor and wall. Secure rough-in fixture piping to prevent movement of exposed piping.

B. Install each fixture with trap easily removable for servicing and cleaning. Install fixture stops in readily accessible location for servicing.

C. Install barrier free fixtures in compliance with Federal ADA Accessibility Guidelines. Install barrier free lavatory traps parallel and adjacent to wall and supplies and stops elevated to 27" above floor to avoid contact by wheelchair users.

D. Handicapped Lavatories: Insulate trap and supply lines with TCI Products Akal+Gaard, Truebro Inc. Handi-Lav-Guard, McGuire Pro-Wrap, or Brocar Products Trap Wrap Kit 500R or 500HS for offset trap.

E. Provide unions at water connections to drinking fountains and electric water coolers.

F. Each fixture shall have a stop valve installation to control the fixture. Stop valves shall be heavy duty type with brass stems and screwed or sweat inlet connections. Compression type inlets are not acceptable.

G. Cover pipe penetrations with escutcheons. Exposed traps, stops, piping and escutcheons to be chrome plated brass, same items in concealed locations may be of rough brass finish.

H. Set floor mounted water closets, floor mounted service sinks; counter mounted lavatories and sinks; lavatory and sink faucets and drains with full setting bed of flexible non-staining plumber's putty. Cover exposed water closet bolts with bolt covers.

I. Set mop basins to floor and wall with grout or silicone sealant.

J. Seal openings between walls, floors and fixtures with mildew-resistant silicone sealant same color as fixture.

K. Test fixtures to demonstrate proper operation. Replace malfunctioning units or components. Adjust valves for intended water flow rate to fixtures without splashing, noise or overflow. Adjust self-closing lavatory faucets to 15 second cycle. Adjust shower valve temperature limit stops to 110 degree maximum outlet temperature.

L. Protect fixtures during construction. Strictly advise all other Divisions to do the same. This Division of Work is responsible for the fixtures until the acceptance and turn-over of the work, at which time all fixtures shall be in perfect condition and in complete working order. At completion of work, thoroughly clean plumbing fixtures and trim using manufacturer's recommended cleaning methods and materials.

M. Fixtures are not to be used unless specifically accepted in written form by the Owner.

N. Existing Fixtures: Where existing fixtures and fittings are indicated to be reused or relocated, this contractor is responsible for documenting condition prior to construction and for damages incurred during construction.

END OF SECTION

SECTION 23 05 00 - GENERAL HVAC REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install a complete building HVAC system as per drawings and enclosed specifications. Provide a competent supervisor, foreman, etc. to expedite all phases of the HVAC Project.

B. Requirements specified herein shall govern applicable portions of all mechanical work sections, whether so stated therein or not. Where items specified in mechanical work sections conflict with requirements in this specification, the former shall govern.

C. Heating Contractor shall provide temporary heating devices as needed until new building heating system is operational and can be used to maintain minimum temperatures in new construction.

D. Job site to be seen to ascertain existing field conditions. Failure to visit the job site does not limit the contractual responsibility of any aspect of the HVAC project.

E. Items To Include:

1. Scope
2. Abbreviations
3. References
4. Definitions
5. Quality Assurance
6. Shop Drawings, Wiring Diagrams and Descriptive Data
7. Substitution of Equipment and Materials
8. Related work of Mechanical Trades
9. Electrical Requirements and Provisions
10. Coordination
11. Temporary Services
12. Codes, Permits and Fees
13. Transportation, Storage and Protection of Equipment and Materials
14. Materials and Equipment Installation
15. Existing Equipment
16. Demolition
17. Sleeves, and Openings
18. Flashing
19. Sealing and Fire stopping
20. Cutting and Patching, Holes and Sleeves
21. Equipment Access
22. General Pressure Piping Specification
23. Painting
24. Trenching and Backfilling

25. Inspection and Tests
26. Cleaning and Flushing
27. Operating Test
28. Operation and Maintenance Manuals
29. Record Drawings
30. Identification
31. Testing and Balancing
32. HVAC System Commissioning

1.2 ABBREVIATIONS

A. The following abbreviations are used throughout all mechanical work sections.

1.	amp	ampere
2.	bhp	brake horsepower
3.	Btu	British Thermal Unit
4.	c to c	center to center or on center
5.	cfm	cubic feet per minute
6.	deg	degree (angle)
7.	F	degree Fahrenheit
8.	fpm	feet per minute
9.	ft.	foot
10.	gal	gallon
11.	gph	gallons per hour
12.	gpm	gallons per minute
13.	hp	horsepower
14.	hr	hour
15.	in. or "	inch
16.	ID	inside diameter
17.	ips	iron pipe size
18.	kw	kilowatt
19.	max	maximum
20.	min	minimum
21.	oz	ounce
22.	OD	outside diameter
23.	os & y	outside screw & yoke
24.	lb.	pound
25.	psi	pounds per square inch
26.	rpm	revolutions per minute
27.	sec	second
28.	std	standard
29.	sp	static pressure
30.	temp	temperature
31.	wwp	water working pressure

1.3 REFERENCES

A. References to standards, codes or specifications shall mean the latest edition of such publication adopted and published at date of invitation to submit proposals.

B. References to technical societies, trade organizations and governmental agencies are made in accordance with the following abbreviations.

1.	AFI	Air Filter Institute
2.	AGA	American Gas Association, Inc.
3.	ANSI	American National Standards Institute
4.	ASHRAE	Amer. Society of Heating, Refrigeration & Air Conditioning Engineers
5.	ASME	American Society of Mechanical Engineers
6.	AMCA	Air Moving & Conditioning Association, Inc
7.	ASTM	American Society for Testing Materials
8.	AWWA	American Water Works Association
9.	BOCA	Building Officials and Code Administrators
10.	CS	Commercial Standard
11.	FM	Factory Mutual
12.	IBR	Institute of Boiler & Radiator Manufacturers
13.	IRI	Industrial Risk Insured
14.	ISOW	Insurance Services of Wisconsin
15.	NAFM	National Association of Fan Manufacturers
16.	NFPA	National Fire Protection Association
17.	NBS	National Bureau of Standards
18.	PDI	Plumbing and Drainage Institute
19.	SBI	Steel Boiler Institute
20.	SMACNA	Sheet Metal & Air Conditioning Contractors National Assoc. Inc
21.	UL	Underwriter's Laboratories, Inc

1.4 DEFINITIONS

A. The following are definitions of terms and expressions used in mechanical work Sections.

1. Provide means furnish and install in place.
2. Herein means contents of a particular section where this term appears.
3. Indicated means indicated on contract drawings.
4. Section denotes "trade section" or basic unit of work.
5. Division denotes a group of related sections. All Mechanical Work falls into Division 23.
6. Concealed means any pipe, duct, conduit or accessories hidden from sight as in trenches, chases, furred spaces, pipe shafts or hung ceilings.
7. Exposed means they are "not concealed" as defined herein above.
8. Piping includes in addition to pipe, fittings, valves, hangers and accessories.

1.5 QUALITY ASSURANCE

A. Comply with manufacturer’s instructions in full detail, including each step in sequence. Should instructions conflict with contract documents, request clarification from Architect/Engineer before proceeding.

B. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated in the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the performance from the system into which these items are placed. This may include changes found necessary during the testing, adjusting and balancing phase of the project.

1.6 SHOP DRAWINGS, WIRING DIAGRAMS AND DESCRIPTIVE DATA

A. Submit shop drawings, wiring diagrams and descriptive data on all equipment, apparatus, fixtures and specialties to be provided. Manufacturer shall prepare these drawings or his franchised dealer for this specific installation unless equipment is stock design then standard shop drawing may be submitted. Drawings shall show all physical sizes and required services, installation instructions, description of operation including recommended testing and adjusting procedures shall be included.

1.7 SUBSTITUTION OF EQUIPMENT AND MATERIALS

A. Assume all responsibility for any and all changes made to the HVAC system due to substitutions. Manufacturers listed first in the Specifications were used in preparing the drawings. Other Manufacturers listed are considered substitutions, but may be submitted for approval as potentially equal to the initial manufacturer identified. Manufacturers not listed in the Specification will not be considered "As Equal" to the design equipment or material.

B. Notify all Contractors of substitutions made prior to their involvement with the substitution installation. Provide all modifications to ductwork and other Construction necessary due to substitutions. Equipment must be accessible for servicing filters, bearings, motors, belts, etc.

1.8 RELATED WORK OF MECHANICAL TRADES

A. The following tabulation of items of work are not all inclusive but are set forth to establish a pattern to be maintained should items occur which are not specifically covered in the various divisions of the work.

1. Plumbing - Any equipment provided by other trades requiring water, compressed air or drainage piping thereto shall have these services provided by that other Trade. Provide a gate valve or stop valve and union at point of connection to such equipment. Provide traps and vents or open sight drains to satisfy drainage requirements of equipment.
2. Heating - Any equipment provided by other trades requiring condensate thereto shall have these services provide by that other Trade. Provide traps and vents to satisfy condensate drainage requirements of equipment using steam.

    a. If regulators or mechanical devices for control of services are necessary, Contractor supplying equipment for installation by this Contractor shall furnish these items.

b. Gas piping shall be specified in heating. Contractor whose scope of work includes gas piping will serve all equipment requiring gas. Special valves, pressure-regulators, etc., if required, will be provided with equipment.

B. Ventilating and Air Conditioning - Provide sheet metal vents or ducts on any equipment furnished by other trades making final connection thereto using flexible connectors in case of ductwork only. Install pre-heat and/or re-heat coils furnished by others. Install temperature control dampers.

C. Refrigeration - Provide piping to cooling coils.

D. Temperature Controls - Any equipment provided by other trades requiring temperature control work shall be provided by this Contractor unless specifically exempted in specifications. Provide schematic diagrams as specified and include pneumatic or electrical work necessary to connect all components to function as a complete system. The Temperature Controls Contractor shall wire control wiring specified in Temperature Control Section.

1.9 ELECTRICAL REQUIREMENTS AND PROVISIONS

A. For electrically operated equipment provide all motors. Starters, controllers, and disconnects which are an integral part of unit equipment shall be provided with that equipment. All other HVAC related starters, controllers and disconnects which are not included as part of the equipment shall be provided by the heating contractor and installed by the electrical contractor. All control devices and sensors associated with the electrically operated equipment shall be provided as part of heating contract, unless otherwise indicated. Deliver starters to Electrical contractor for installation.

B. The heating contractor shall furnish all fused and/or circuit breaker disconnect switches. Deliver disconnect switches to electrical contractor for installation near HVAC equipment. Field coordinate loads and locations with electrical contractor.

1.10 COORDINATION

A. Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, diffusers, registers, grilles and recessed or semi-recessed heating and/or cooling terminal units installed in/on architectural surfaces.

B. Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor’s work shall be removed or relocated at the installing contractor’s expense.

1.11 TEMPORARY SERVICES

A. Whenever temporary services are required to maintain operation of equipment, it is understood that the Contractors responsible for final connections to permanent services shall do this temporary work. All temporary material shall be removed after it has served its use. See Special Conditions for temporary services required during construction of project.

1.12 CODES, PERMITS AND FEES

A. All Mechanical work shall conform with all Federal, State and Local Codes and regulations. If codes or regulations conflict, the most stringent shall apply. Permits and inspection fees are to be secured in fulfilling the requirements of these Specifications.

1.13 TRANSPORTATION, STORAGE AND PROTECTION OF EQUIPMENT AND MATERIALS

A. Transport and handle equipment by methods to avoid damage. Promptly inspect shipments to assure that equipment complies with requirements, quantities are correct and equipment is undamaged.

B. Cover equipment and materials to eliminate rust and corrosion while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube and fitting ends to avoid damage.

C. Provide access for inspection of all stored equipment. Periodically inspect to assure equipment is undamaged and are maintained under required conditions.

D. Offsite storage agreements will not relieve contractor from using proper storage techniques.

1.14 MATERIALS AND EQUIPMENT INSTALLATION

A. Materials and equipment shall be new and of the make, type, size and quality specified. See Instructions for Bidders for bidding procedure.

B. Erect equipment in neat workmanlike manner, align, level and adjust for satisfactory operation; install for easy maintenance, inspection, operation, and replacement. Minor deviation from indicated arrangements may be made as approved.

C. Mechanical equipment shall operate without objectionable noise or vibration. Ductwork and piping shall be provided with flexible couplings to prevent noises or vibration transmission.

1.15 EXISTING EQUIPMENT

A. The Mechanical Contractor shall remove and or modify existing ductwork and piping as indicated on the construction documents.

B. The Mechanical Contractor shall remove or modify existing mechanical equipments as indicated on the construction documents.

C. All equipment removed by the Mechanical Contractor and not reused as part of this project shall, or as requested to be retained by the Owner, become property of the Mechanical Contractor and shall be removed from the premises. Items requested to be retained by the Owner shall be delivered to a site as directed by the Owner.

1.16 DEMOLITION

A. Perform all demolition as indicated on the drawings to accomplish new work. In occupied areas where demolition work is to be performed adjacent to existing work that remains, construct temporary dust partition to minimize the amount of contamination of the occupied space. Where pipe or ductwork is removed and not reconnected with new work, cap ends of existing services as if they were new work. Coordinate work with building occupant to minimize disruption.

B. All piping, wiring and associated conduit, insulation, ductwork and similar items demolished, abandoned, or deactivated are to be removed from the site by the Mechanical Contractor unless requested to be retained by the Owner. Maintain the condition of material and/or equipment that is indicated to be reused equal or better to that existing before work began.

1.17 SLEEVES, AND OPENINGS

A. Pipe Sleeves:

1. Provide galvanized sheet metal sleeves for pipe penetrations through interior walls to provide a backing for sealant or firestopping.
2. Provide schedule 40 steel pipe for pipe penetrations through exterior walls, non-rated beams, footings and potentially wet applications to provide backing for sealant and firestopping.
3. Sleeves for piping in new poured concrete construction shall be schedule 40 steel pipe, cast in place.
4. In all piping floor penetrations, fire rated and non-fire rated, top of sleeve shall extend 1” above the adjacent floor. Caulk sleeves full depth and provide floor plate.

    a. Sleeves in non-rated floor penetrations shall be 18 gauge galvanized steel.
    b. Sleeves in rated floor penetrations shall be UL listed prefabricated sleeve including seals.
    c. If the pipe penetrating the sleeve is supported be a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve to transfer weight to floor structure.

5. In finished spaces where pipe penetration through wall is exposed, provide chrome plated steel escutcheons installed flush with face of penetrated surface.
6. Size sleeves large enough to allow for expansion and contraction. Provide for continuous insulation wrapping.

B. Duct Sleeves:

1. Duct sleeves are not required in non-rated floors or partitions.
2. Provide sleeve required for fire dampers in fire-rated partitions and floors. Install sleeve per manufacturer's recommendation.

C. Openings:

1. Any opening over 12" in width penetrating masonry or concrete construction requires additional structural support. Mechanical contractor shall be responsible for coordinating with the General Contractor for sizes and locations of openings.

D. Furnish sleeves to General Contractor for placement into formwork

1.18 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors and roofs.

B. Flash pipes projecting 3" minimum above finished roof surface with lead worked one inch minimum into hub, 8" minimum clear on sides with 24x24 sheet size. For pipes through outside walls, turn back into wall and caulk, metal counterflash and seal.

C. Provide welded curbs for mechanical roof installation 12" minimum high above roofing surface. Flexible sheet flash and counterflash with sheetmetal; seal watertight.

D. Metal Flashing: 26 gauge galvanized steel.

E. Lead Flashing: 5 lbs./sq. ft. sheet lead for waterproofing; one lb./sq. ft (5 kg/sq. m) sheet lead for soundproofing.

F. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.

G. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

1.19 SEALING AND FIRESTOPPING

A. Sealing and Fire stopping of sleeves/openings between ductwork, piping, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing.

B. FIRE AND/OR SMOKE RATED PENETRATIONS:

1. Provide material and perform work in compliance with the following:

a. Wisconsin Administrative Code
b. Provide materials tested and listed by Underwriters Laboratories.

c. Provide materials which have been tested in accordance with ASTM E814-88: Standard Test Method for Fire Tests of Through-Penetration Firestops.
d. Materials shall have been tested to provide fire rating at least equal to that of the construction being penetrated and shall comply with the T-ratings as required by applicable building code.

2. Contractor shall submit product data for each firestop system.
3. Contractor shall use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail. Use product that has a rating not less then the rating of the wall or floor being penetrated.
4. Install approved product in accordance with the manufacturer's instructions where the pipes and ductwork penetrate a fire/smoke rated surface. When pipe or ductwork is insulated, use a product which maintains the integrity of the insulation and vapor barrier.

C. NON-RATED PENETRATIONS:

1. Pipe Penetrations Through Below Grade Walls: In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated pipe and the wall sleeve.
2. Pipe Penetrations: At pipe penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between pipe and insulation and sleeve.
3. Duct Penetrations: Annular space between duct (with or without insulation) and the non-rated partition or floor opening shall not be larger than 2". Where existing openings have and annular space larger than 2", the space shall be patched to match existing construction to within 2" around the duct. Coordinate with the General Contractor for this work.
4. Where shown or specified, pack annular space with fiberglass batt insulation or mineral wool insulation. Provide sheet metal escutcheon around duct on both sides of partition or floor to cover annular space.
5. In finished spaces where duct penetrations are exposed, pack annular space with fiberglass batt insulation or mineral wool insulation. Patch annular space to match adjacent construction for a finished appearance. Coordinate with General Contractor for this work.

1.20 CUTTING AND PATCHING, HOLES AND SLEEVES

A. It shall be the responsibility of the Mechanical Contractor to furnish the applicable contractor with all opening dimensions where required for installing the mechanical work. All dimensions must be verified with equipment shop drawings.

B. All required core drilling of holes in floors or walls necessary to install piping and conduit is the responsibility of the Mechanical Contractor. All core drilled holes must be drilled carefully as to avoid spalling, and unnecessary damage or weakening of structural members. Avoid chopping or breaking out.

1.21 EQUIPMENT ACCESS

A. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance and service.

1.22 GENERAL PRESSURE PIPING SPECIFICATION

A. The following piping practice shall be followed in installing all steel or copper piping:

1. Full length of pipe shall be used wherever possible; short lengths of pipe with couplings will not be permitted.
2. All pipes shall be cut to exact measurements and shall be installed without forcing or springing so as not to cause excess stress in valves or equipment.
3. All piping shall slope a minimum of 1" in 50'-0" in the direction of flow unless otherwise noted on drawings.
4. All branch connections shall be made into top of mains unless otherwise noted on drawings.
5. All changes in direction shall be made by using pipe and fittings or by shop fabricated pipe bends. Field pipe bends are prohibited.
6. Unions shall be installed in all pipe connections to equipment, control valves, controllers, steam traps, and wherever necessary to facilitate the dismantling of piping and removal of other items requiring maintenance.
7. Exposed piping shall be neatly arranged, straight, run parallel, and at right angles to walls and shall be so graded that the entire system can be drained. Drain valves shall be installed at low points of piping.
8. Install pipe anchors and expansion bends or swing connections where so indicated on drawings.
9. Installed piping shall not interfere with the operation or accessibility of doors or windows, shall not encroach on aisle passageways and equipment, and shall not interfere with the servicing or maintenance of any equipment.
10. When pipe size is reduced, reducing fittings are required. No bushings shall be used.

1.23 PAINTING

A. Structural iron HVAC equipment supports and piping exposed to the outdoors shall be given one coat of Rustoleum or equivalent rust-free type paint. Galvanized supports are not paint required.

1.24 INSPECTION AND TESTS

A. See section 23 05 03 – Pipe and Fittings

1.25 OPERATING TEST

A. General:

1. Perform tests as outlined below and submit test results to the Architect before Owner operates equipment.
2. Equipment shall be complete with all components connected before making tests.
3. Make adjustments, repairs, and alterations, as required to meet specified test results. Correct defects disclosed by tests or inspection; replace defective parts when directed.
4. In replacing defective parts use only new materials; in case of pipe, replace with same length as defective piece.
5. Caulking of screwed joints or peening of welds, will not be permitted.
6. Repeat tests after defects have been corrected and parts replaced, as directed, until pronounced satisfactory.
7. Tests all alarms, flow switches, level controls, low and high-pressure cut outs and all other safety devices. Test results submittal shall list items tested.
8. Bear costs of repairs and restoration of work of other trades damaged by the tests or cutting that had to be done in connection with the tests.

B. Heating System:

1. Adjust and regulate heating system to circulate freely, noiselessly, and to distribute heating media proportionately to all heating surfaces. Adjust and balance hot water heating system to equalize circulation for all heating surfaces. Adjust automatic temperature controls for satisfactory operation.
2. Operate system for tests during heating season of the first year of operation at times when directed, for proper setting and adjusting. Furnish copies of test data as directed.

C. Testing and Balancing:

1. Provide the services of a qualified independent firm engaged in the business of air balance to adjust and balance ventilating systems.

D. Refrigeration:

1. Test refrigeration equipment under 100% load conditions, artificial if necessary, before Owner operates equipment.

1.26 OPERATION AND MAINTENANCE MANUALS

A. Maintenance manuals shall be prepared covering the HVAC systems of the building, including refrigeration and temperature controls.

B. Submit manuals in the quantity and format as specified in Division 01 section Contract Closeout.

C. These manuals shall include the following information:

1. Name and address and telephone number of installing General Contractor and Subcontractors
2. Description of Systems
3. Test results and reports

    a. Installation checks on pumps, fans and related equipment
    b. Air balance
    c. Results of all pressure tests with witness signature, data made, etc.
    d. Water treatment test results, including tests for absence of bacteria in domestic water system
    e. Valve identification charts

4. General Operating Instructions: Instructions shall include locations of equipment or controls, which will require periodic adjustment.
5. Maintenance Instruction: These shall include manufacturer's maintenance for all equipment.

D. The above information including equipment shop drawings, fixture cuts, etc. shall be placed in three ring loose-leaf hard cover binders with section tabs labeled with project name and contents. Submit to Architect prior to final billing.

1.27 RECORD DRAWINGS

A. Prepare and submit to Architect/Engineer a complete layout of piping and duct systems as actually installed showing location, size changes, and elevations for permanent record drawings. Drawings must be provided in AutoCad .dwg format for reproduction along with (1) hard copy.

1.28 IDENTIFICATION

A. General:

1. Do not label equipment such as cabinet heaters, convectors, radiation, ceiling fans or any other equipment in occupied spaces.

B. Pipe:

1. All piping shall be color-coded using legend markers and directional arrows after piping has been covered (if specifications call for insulation) and after piping has been painted.
2. Use Setmark System pipe markers with arrows as manufactured by Seton Name Plate Corp. Pipe stencils are not acceptable.
3. Install markers as recommended by the manufacturer.
4. Locate pipe identification as follows:

    a. Within 1’-6” of each valve
    b. Within 3’-0” of each 90° elbow
    c. Within 3’-0” of piping connection to equipment

d. Within 3’-0” of where pipe enters shafts and penetrates floor and outside walls.
e. Maximum 20’-0” intervals along all piping (exposed and concealed). Not less than one label shall be installed per room.
f. Within 1’-6” of any access door or panel
g. At all tees within 3’-0” of both mains and branch piping.
h. Where new piping meets existing piping, place one additional label on existing piping as specified in items ‘a’ through ‘f’.
i. On remodeling projects, contractor shall include in bid, one extra (case or roll) of all ordered system colors and/or bands to turn over to owner.
j. Stenciling of piping is not acceptable.

C. Valves:

1. After piping work is complete and pipe insulation is finished, tag valves on all piping. Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device or located in another room not visible from the terminal unit. Indentify valves with consecutive numbers on tags.
2. Provide Seton Name Plate Company Style M4506 brass valve tags, 1-1/2" diameter, black filled characters, 1/2" numbers, 1/4" letters, with size No. 6 nickel-plated bead chains for fastening to each valve stem as required.
3. Abbreviations are as follows:

a.	Ventilating	VNTG
b.	Plumbing	PLBG
c.	Heating	HTG
d.	Refrigeration	REF

4. Furnish Seton Name Plate Company 37411 valve identification charts in a satin-finish self-closing aluminum frame, size 9-1/2" x 12".
5. Complete chart showing contractor's name and address, name of system, number, location, and purpose of each valve tagged.
6. Mount enclosed chart in Mechanical Room or Boiler Room or as directed by the owner.
7. Provide two (2) copies of charts and place in Maintenance Manual.

D. Exterior Mounted Equipment:

1. Identify exterior mounted mechanical equipment by stenciling equipment number with black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion.
2. Whenever possible, paint equipment number so it is visible from point of roof access.

E. Interior mounted equipment:

1. Provide Seton Seatonflex Style M1771 Name Plate for all equipment such as air handling equipment, pumps, package air conditioners, starters, and disconnects. Plates shall bear name of equipment as noted in drawings and specifications i.e., Supply Fan #1. Plates shall be 2-1/2" x 3/4" multi-layered acrylic, white characters with a black background.

F. Submit a list of plates for Architect's approval before ordering.

1.29 TESTING, ADJUSTING AND BALANCING

A. See requirements in Section 23 05 93 – Testing, Adjusting, and Balancing

B. Include the complete cost of air system testing and balancing in the Bid.

C. T & B procedures, methods and instrumentation shall be in strict accordance with the established standards of the National Environmental Balancing Bureau (NEBB) or the Associated Air Balance Council (AABC).

D. Provide the services of a qualified independent NEBB or AABC certified firm engaged in the business of air balance to adjust and balance ventilating systems.

E. Mechanical Contractor shall assume the responsibility for the following:

1. Purchase and installation of any replacement component of equipment drive assemblies as directed by the Test and Balance Contractor.
2. Filter replacement and installation.
3. Adjustment of isolation devices.
4. Equipment conformity to sound level requirements.
5. Purchase and replacement of motor starter heater elements, as directed.
6. Proper adjustment and calibration of temperature control instruments and devices.
7. Leak testing of ductwork and piping.
8. Installation of volume dampers where shown, or where required as directed by the Test and Balance Contractor.
9. Instruction to owner on system operation.
10. Furnishing of ladders and or scaffolding as directed by the Test and Balance Contractor.
11. Furnish the Test and Balance Contractor with one set of “As-built” drawings and one complete set of certified shop drawings at least two weeks prior to commencement of work.

END OF SECTION 23 05 00

SECTION 23 05 03 - PIPING AND FITTINGS

PART 1 - GENERAL

1.1 SCOPE

A. All work in this section is subject to the provisions of the General HVAC Requirements, and all other parts of the Contract Documents applicable to this Section of Work.

1.2 WORK INCLUDED

A. Natural Gas Piping

B. Cooling Coil Condensate

C. Refrigerant Piping

D. Unions and Flanges

1.3 RELATED WORK

A. Section 23 05 29 - Supports and Anchors

B. Section 23 07 00 - HVAC Insulation

1.4 REFERENCES

A. ANSI/ASME - Boiler and Pressure Vessel Code

B. ANSI/ASME Sec 9 - Welding and Brazing Qualifications

C. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV

D. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV

E. ANSI B31.1 - Code for power piping (over 125 psig)

F. ANSI/ASME B31.9 - Building Services Piping

G. ANSI/AWS A5.8 - Brazing Filler Metal

H. ANSI Z49.1 - Safety in Welding and Cutting

I. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless

J. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses

K. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

L. ASTM B32 - Solder Metal

M. ASTM B88 - Seamless Copper Water Tube

N. AWS D1.1 - Structural Welding Code

1.5 QUALITY ASSURANCE

A. Welder Qualifications:

1. Welding procedures, welders, and welding operators for all building service piping and steam piping less than or equal to 15 psig to be in accordance with certified welding procedures of the National Certified Pipe Welding Bureau.
2. Welding procedures, welders, and welding operators for all steam system piping at service pressures above 15 psig to be qualified complying with the provisions of the latest revision of ANSI/ASME B31.1 Power Piping or Section IX of the ASME Boiler and Pressure Vessel Code for boiler external piping.
3. Before any metallic welding is performed, Contractor to submit his/her Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section IX of the ASME Boiler and Pressure Vessel Code and/or the National Certified Pipe Welding Bureau.
4. Before any polyethylene fusion welding is performed, Contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures in accordance with the Code of Federal Regulations, Title 49, Part 192, Section 192.285.
5. The Architect/Engineer reserves the right to test the work of any welder employed on the project, at the Contractor's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project.
6. Note: In addition to requirements described above, contractor shall submit the following information to architect/engineer for review:

    a. Provide a project summary listing contractors' standard welding procedure specification.
    b. List all welders scheduled to work on the project.
    c. List all pipe sizes to be welded.
    d. Provide continuity record of each welder for every six month interval after passing the qualification test.

1.6 SUBMITTALS

A. Submit product data under provisions of Section 23 05 00.

B. Include data on pipe materials, pipe fittings, and accessories.

PART 2 - PRODUCTS

2.1 NATURAL GAS

A. 2" and smaller: ASTM A53, type E or S, standard weight (schedule 40) black steel pipe with ASTM A197/ANSI B16.3, Class 150, black malleable iron threaded fittings or ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

B. 2 ½" and larger: ASTM A53, type E or S, standard weight (schedule 40) black steel pipe with ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

C. Underground Gas Piping: All sizes shall be ASTM A53. standard weight (schedule 40) X-TRU-COAT plastic coated steel pipe. All fitting shall be welded.

2.2 COOLING COIL CONDENSATE

A. ASTM B88, type L, hard temper copper tubing with ASTM B145/ANSI B16.23 cast red bronze or ASTM B75/ANSI B16.29 wrought solder type drainage fittings.

2.3 REFRIGERANT PIPING

A. ASTM B88, type L, hard drawn copper tube, cleaned and capped in accordance with ASTM B280, and marked "ACR", with ANSI B16.22 wrought copper or forged brass solder type fittings.

B. Pre-charged tubing with manufacturer's standard refrigerant specialties maybe used on systems less than 5-tons.

2.4 UNIONS AND FLANGES

A. 2" and smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black iron on black steel piping. Use unions of a pressure class equal or higher than that specified for the fittings of the respective piping service but not less than 250 psi.

B. 2 ½" and larger: ASTM 181 or A105, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern and of a pressure class compatible with that specified for valves, piping specialties and fittings of the respective piping service. Flanges smaller than 2 ½" may be used as needed for connecting to equipment and piping specialties. Use raised face flanges ANSI B16.5 for mating with other raised face flanges on equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for mating with other flat face flanges on equipment. Gasket material to be non-asbestos and suitable for pressures and temperatures of the piping system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. After completion, fill, clean, and treat systems.

3.2 INSTALLATION

A. General:

1. Install all piping plumb and parallel to building walls and ceilings and at heights which do not obstruct any portion of windows, doorways, stairways, or passage ways. Where interferences develop in the field, offset or reroute piping as required to clear such interferences
2. Group piping whenever practical at common elevations.
3. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
4. Provide clearance for installation of insulation, and access to valves and fittings.
5. Do not route piping through elevator equipment rooms unless piping is serving equipment in this room.
6. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
7. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain bottom of pipe level.
8. Install unions downstream of valves and at equipment or apparatus connections.
9. Welding is required on all black piping 2 ½” and larger.
10. Copper piping may be used for heating water service in lieu of Schedule 40 Black on piping 2” and smaller. Install brass ball valve at junction of dissimilar piping.

B. Welded Pipe Joints:

1. Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable.

C. Threaded Pipe Joints:

1. Use a thread lubricant or Teflon tape on threaded pipe joints; no hard setting pipe thread cements or caulking is allowed.

D. Copper Pipe Joints:

1. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean all fittings and tube with emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joints. Use 95-5 solder or brazing to secure joint as specified for the specific piping service.

E. Natural Gas Piping:

1. Entire gas piping installation shall be in accordance with the latest requirements of the AGA, NFPA 54 – National Fuel Gas Code, State, and Local Codes.
2. Permissible Assemblies for Welding Piping Systems:

    a. The following specification covers permissible assemblies for welded pipe lines for all services operating at 160 psig or less.

        1) Mitered tees will not be permitted in welded lines. Connections shall be made with welding tees. The use of lines provided they are installed in prefabricated assemblies and the pipe interior is cleaned of slag. Field installation of weldolets will be permitted in lines 5” and larger if the installation is cleaned inside after welding.
        2) The use of mitered elbows in welded lines will not be permitted. Welding elbows shall be used for bends.
        3) Mitered reducers will not be permitted in welded lines.
        4) The pipe ends in tees, laterals, and reducers shall be carefully prepared to provide for proper weld penetration.
        5) Steel and iron piping, 2-1/2” in size and larger, shall have joints welded, except joints obviously intended to be connected by means of bolted flanges. End to end joints of the same size pipe sizes 3/4”through 1” may be butt welded provided that an internal welding ring is used.

3. Do not install gas piping below a building or its foundation.
4. Gas piping shall be installed with plugged drip pockets at low points.
5. Valves, gas cocks, and unions shall be installed on inlet pipe to equipment including safety valves where required or noted to be installed.
6. Connect gas piping to gas meter provided by local gas company.
7. All gas piping in inaccessible areas and piping 2 ½” and larger shall have welded joints. Provide pre-weld type fittings. Paint welded areas with primer.
8. Pitch horizontal piping down 1 inch in 60 feet in the direction of flow. Install full size dirt leg at the bottom of each vertical run and at each appliance. When installing mains and branches, cap gas tight each tee or pipe end which will not be immediately extended. All branch connections to the main shall be from the top of the main.
9. Prime coat and apply rust resistant finish enamel coat to all gas piping exposed to weather. Paint gas piping to blend in with adjacent wall or roof color. Color is subject to approval by architect.
10. All interior gas piping shall be prime coated and painted with rust resistant finish enamel coat. Paint color shall be yellow and labeled “Natural Gas” with flow directional arrows.

F. Cooling Coil Condensate:

1. Trap each cooling coil drain pan connection with a trap seal of sufficient depth to prevent conditioned air from moving through the piping. Extend piping to nearest code approved drain location. Construct trap with plugged tee for cleanout purposes.

G. Refrigerant:

1. Refrigerant piping to be installed by firms who are experienced in installation of such piping and in accordance with the requirements of Wisconsin Administrative Code Section ILHR 45.
2. All solder joints to be ASTM Grade 4 or 5 and have a melting point of approximately 1250 degrees F. Solder impurities shall not exceed 0.15%. Tubing to be new and delivered to job site with the original mill end caps in place. Clean and polish all joints before soldering. Purge all lines with nitrogen during soldering. Provide manual shut-off and check valves as required.
3. No refrigerant is to be vented directly to the atmosphere. During evacuation procedures, use equipment designed to recover and allow recycling of refrigerant.
4. After completion of leak tests, evacuate system with a vacuum pump to an absolute pressure not to exceed 1500 microns while the system ambient temperature is above 60 deg. F. Break the vacuum to 2 psig with the refrigerant to be used in the system. Repeat the evacuation procedure. Install a drier of the required size in the liquid line, open the compressor suction and discharge valves, and evacuate to an absolute pressure not to exceed 500 microns. Leave vacuum pump running for not less than two hours without interruption. Raise system pressure to 2 psig with refrigerant and remove vacuum pump.
5. Charge refrigerant directly from original drums through a combination filter-drier. Charge the system by means of a charging fitting in the liquid line. Record the weight of the refrigerant in the system.

H. Unions and Flanges:

1. Install unions and flanges as required at each automatic control valve and at each piping specialty or piece of equipment which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve.

I. Leak Testing:

1. Verify that the piping system being tested is fully connected to all components and that all equipment is properly installed, wired and ready for operation. If required for additional pressure load under test, provide temporary restraints at expansion joints or isolate them during test.
2. Do not insulate piping systems until system has been properly tested and repaired. If leaks are found, repair area with new materials and repeat test. Caulking of leaks is not acceptable.
3. For hydrostatic testing, use clean water and remove all air from the system being tested.
4. For air tests, gradually increase pressure to not more than one half of test pressure and increase pressure in steps of approximately one tenth of the test pressure until test pressure is reached.

5. Refrigerant: Leak test system by charging the system to pressure of 10 psig with an HFC refrigerant. Test with the compressor suction and discharge valves closed and with all other system valves open. Increase pressure to 300 psig with dry nitrogen. Check for leaks with an electric leak detector having a certified sensitivity of at least one ounce per year. Seal any leaks found and retest system.
6. Natural gas piping shall be air tested at 100 psig for 24 hours with no drop in pressure or as dictated by local codes or ordinances if greater.

END OF SECTION 23 05 03

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SECTION 23 05 13 - MOTOR AND STARTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the contract, including General and Supplementary Conditions and Division 01 specification sections apply to work of this Section.

1.2 RELATED WORK

A. 26 00 00 - Electrical for Power Wiring

1.3 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

B. Conform to current National Electrical Manufactures Association (NEMA) Standards.

C. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

D. Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

E. Constructed in accordance with ASME

F. Conform to Electrical Equipment Manufactures Advisory Council Standards

G. Device specific standards are included in product specifications.

1.4 DESCRIPTION OF WORK

A. MECHANICAL CONTRACTOR

1. Shall furnish all starting equipment including selector switches, relays, etc. He shall turn all manual and magnetic starters over to the Electrical Contractor with complete instructions and wiring diagrams required for a complete installation. All other control equipment shall be turned over to the Temperature Control subcontractor for installation.
2. Verify final locations with the Owner and the Electrical Contractor.
3. Shall furnish all fused and/or circuit breaker disconnects as required if not furnished with the equipment and turn over to the Electrical Contractor for installation.
4. Shall furnish and install all control wiring.
5. Shall confirm voltage requirements with the Electrical Contractor prior to ordering equipment.

B. ELECTRICAL CONTRACTOR

1. Will install all fused and/or circuit breaker disconnect switches that are furnished with mechanical equipment or by the Mechanical Contractor. Electrical Contractor shall coordinate exact requirements with the Mechanical Contractor and the actual equipment furnished.
2. Will furnish and install all power wiring from panel board to motors and junction boxes in factory-assembled units.
3. Will install all starters in cooperation with and under the supervision of the Mechanical Contractor.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 23 05 00.

B. Include dimensions, capacities, materials of construction, weights, wiring diagrams and appropriate identification for all equipment in this Section.

C. Submit manufacturer's installation instructions.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 23 05 00.

1.7 REFERENCE STANDARDS

A. ANSI/IEEE 112 – Test Procedure for Polyphase Induction Motors and Generators

B. Constructed in accordance with ASME

C. ANSI/NEMA MG-1 – Motors and Generators

D. ANSI/NFPA 70 – National Electrical Code

E. IECC 2015 with Wisconsin amendments (SPS 363)

PART 2 - PRODUCTS

2.1 MOTOR REQUIREMENTS

A. All electric motors shall be NEMA standard motors.

B. All electronically commutated (EC) motors shall be complete with integral potentiometer, motor power input wire whip, and motor control input wire whip for 0-10 VDC control signal.

C. All motors 1 HP and larger shall meet or exceed requirements of ASHRAE 90.1.

D. All motors 1-1/2 HP and larger shall meet or exceed local utility requirements for high efficiency motors. Mechanical Contractor shall verify current requirements with utility.

E. All motors used on variable frequency drives must be suitable for use with the drive, including but

2.2 STARTING EQUIPMENT

A. Manufacturers: Allen-Bradley, Cutler Hammer, Eaton, Johnson Controls, Square D, General Electric, Franklin Control Systems, Taco, or ABB Control Inc.

B. All starters shall be NEMA standard sizes and all starting equipment shall be of the same manufacturer.

C. All starters, push buttons and selector switches shall have NEMA Type 1 enclosures.

2.3 SINGLE PHASE, MANUAL STARTER

A. All manual starters shall be two pole for single phase fractional horsepower service with lockable on-off switch, hand-off-auto, power-run-fault indication lights, electronic overload protection, control system contacts, auxiliary dry contacts, manual-auto reset selection, fault relay, status relay, and power failure return mode. Franklin BAS-1P, Johnson Controls BMMS-1P, Taco T1P, or approved equal.

B. Except where indicated otherwise, all magnetic starters shall be combination type with circuit breaker across the line for three phase service with reset button in cover, pilot light, overload protection for each phase, undervoltage protection, missing phase protection, phase reversal, built- in control circuit transformer with 120 volt operating coils and hand-off-auto selector switch factory mounted in starter flange.

C. All starters shall be equipped with auxiliary contacts or control relays for equipment control interlocking as required.

1. Snap action switch.
2. Thermal overload device.
3. Locking attachment.
4. Pilot indicating light.
5. Conform to NEMA ICS2 and EEMAC standards.

D. Enclosure

1. NEMA type 1, NEMA type 4X as required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that equipment is in compliance with approved submittal drawings.

B. Examine area to receive motor starter to assure adequate clearance for motor starter installation.

C. Start work only after unsatisfactory conditions have been corrected.

3.2 FIELD MEASUREMENTS

A. Field verify locations of panelboards with other trades. Adjust as required to meet field conditions and code requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

C. Do not store motor starters exposed to weather.

D. Protect motor starters against damage from work of other trades.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until detention areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment, and written notice received by ESC from Architect stating that these conditions exist at building site.
4. The electrical installation shall conform to division 26 specification.

B. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.
2. Install mounted firmly to wall of structural surface.

C. Final Testing

1. Verify over current protection thermal unit size with motor nameplate to provide proper operation and compliance with NEC.
2. Megger check of phase-to-phase and phase-to-ground insulation levels.
3. Do not megger check solid state equipment.

4. Test for continuity between line and load terminals and between control terminals.
5. Short circuit.
6. Operational check.
7. Test each motor and permanently record following information:

    a. Motor identification as to the load served.
    b. Nameplate data.
    c. Overload relay equipment.
    d. Protective relay (if any) setting.
    e. Voltage and current phase readings.
    f. Direction of rotation.
    g. Furnish spare overloads in each size utilized and turn over to owner.

D. Adjustment And Cleaning

1. Adjust covers and operating mechanisms for free mechanical movement.
2. Tighten wire and cable connections.
3. Clean interior of enclosure.
4. Touch up scratched or marred surfaces to match original finish.

END OF SECTION 23 05 13

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SECTION 23 05 23 - VALVES

PART 1 - GENERAL

1.1 SCOPE

A. All work in this section is subject to the provisions of the General HVAC Requirements, and all other parts of the Contract Documents applicable to this Section of Work.

1.2 WORK INCLUDED

A. Natural gas systems

1.3 RELATED WORK

A. Section 23 05 29 - Supports and Anchors

B. Section 23 07 00 – HVAC Insulation

1.4 REFERENCES

A. ANSI/ASME - Boiler and Pressure Vessel Code

B. ANSI/ASME Sec 9 - Welding and Brazing Qualifications

C. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV

D. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV

E. ANSI/ASME B31.9 - Building Services Piping

F. ANSI/AWS A5.8 - Brazing Filler Metal

G. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless

H. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses

I. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

J. ASTM B32 - Solder Metal

K. ASTM B88 - Seamless Copper Water Tube

1.5 QUALITY ASSURANCE

A. Manufacturer's name and pressure rating marked on valve body.

1.6 SUBMITTALS

A. Submit product data under provisions of Section 23 05 00.

B. Contractor shall submit a schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on project.

C. Contractors desiring to use any valve other than those specified must submit a listing of specified valve numbers with corresponding number of substituted manufacturer. This list must be approved prior to valve installation.

PART 2 - PRODUCTS

2.1 NATURAL GAS SYSTEMS

A. Shut-off Valves:

1. 2" and smaller: Ball valve, bronze body, threaded ends, stainless steel ball, full or conventional port, Teflon seat, blow-out proof stem, two-piece construction, suitable for 150 psig working pressure, U.L. listed for use as natural gas shut-off.
2. 2 ½" through 4": Cast iron body, flanged ends. bronze bearings, electroless nickel plated cast iron plug with Heat resilient plug seal, Buna-N stem seal packing, lever actuator, 175 psig W.O.G., U.L. listed for use as a natural gas shut-off.
3. 5" and larger: Cast iron body, flanged ends, stainless steel bearings, resilient faced plugs, totally enclosed hand wheel actuators, 175 psig W.O.G., U.L. listed for use as a natural gas shut-off.
4. DeZurick, Homestead or Rockwelll

B. Gas Pressure Regulators:

1. Provide regulators with spring having an adjustment range from 4" or 5.5" w.c. to 12" w.c. with 2 lb. inlet pressure.

    a. For natural gas loads up to 289,000 BTUH use Maxitrol model 325-3
    b. For natural gas loads of 289.000 to 637,000 BTUH use Maxitrol model 325-5
    c. For natural gas loads of 673,000 to 1,200,000 BTUH use Maxitrol model 325-5H
    d. For natural gas loads greater than 1,200,000 BTUH use Maxitrol series 210 high capacity regulators.

PART 3 - EXECUTION

3.1 GENERAL

A. Properly align piping before installation of valves in an upright position; operators installed below the valves will not be accepted.

B. Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

C. Install all valves with the stem in the upright position. Valves may be installed with the stem in the horizontal position only where space limitations do not allow installation in an upright position or where large valves are provided with chain wheel operators. Where valves 2-1/2" and larger are located more than 12'-0" above mechanical room floors, install valve with stem in the horizontal position and provide a chain wheel operator. Valves installed with the stems down, will not be accepted.

D. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with General Contractor.

E. Install unions downstream of valves and at equipment or apparatus connections.

F. Install brass male adapters each side of valves in copper piped systems. Sweat solder adapters to pipe.

G. Prior to flushing of piping systems, place all valves in the full-open position.

3.2 SHUT-OFF VALVES

A. Install shut-off valves at all equipment, at each branch take-off from mains, and at each automatic valve for isolation or repair.

3.3 GAS PRESSURE REGULATORS

A. Gas regulating valves shall be selected for gas pressure as indicated in the contract documents. Furnish and install regulating valves on appliances and heating equipment as required to maintain proper gas pressure.

B. Vent regulators for loads greater than 150,000 BTUH. Use larger size vent when required by the manufacturer’s installation instructions. Each gas pressure valve vent and relief valve vent shall be run separately to a point outside the building, terminated with a screened vent cap, and located according to gas utility regulations and codes.

END OF SECTION 23 05 23

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SECTION 23 05 29 - SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 SCOPE

A. All work in this section is subject to the provisions of the General HVAC Requirements, and all other parts of the Contract Documents applicable to this Section of Work.

1.2 WORK INCLUDED

A. Pipe, duct, and equipment hangers, supports, and associated anchors

B. Equipment bases and supports

1.3 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish hanger and support inserts to General Contractor for placement into formwork.

1.4 RELATED WORK

A. Section 23 05 03 – Piping and Fittings

B. Section 23 05 48 – Vibration Isolation

C. Section 23 07 00 – HVAC Insulation

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 23 05 00.

B. Indicate hanger and support framing and attachment methods.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:

1. Grinnell
2. B-Line
3. Mason
4. Michigan Hanger
5. Unistrut

B. Hangers for Pipe Sizes 1/2” to 1-1/2”: Carbon steel, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2” to 4” and Cold Pipe Sizes 5” and Over: Carbon steel, adjustable, clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods; cast iron roll and stand for hot pipe sizes 5" and over.

E. Wall Support for Pipe Sizes to 3” (76 mm): Cast iron hook.

F. Wall Support for Pipe Sizes 4” and Over: Welded steel bracket and wrought steel clamp.

G. Vertical Support: Steel riser clamp.

H. Floor Support for Pipe Sizes to 4” and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

I. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

J. Shield for Insulated Piping 2” and Smaller: 18 gauge galvanized steel shield over insulation in 180 degree segments, minimum 12” (300 mm) long at pipe support.

K. Shield for Insulated Piping 2-1/2” and Larger: Pipe covering protective saddles.

L. Shields for Vertical Copper Pipe Risers: Sheet lead.

2.2 HANGER RODS

A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

B. Size rods for individual hangers and trapeze support as indicated below:

Max. Load (Lbs.)	Rod Diameter
610	3 / 8”
1130	1 / 2”
1810	5 / 8”
2710	3 / 4”
3770	7 / 8”
4960	1”
8000	1-1 / 4”

C. Total weight of equipment, including valves, fittings, pipe, pipe content and insulation are not to exceed the limits indicated. Provide rods complete with adjusting and lock nuts.

2.3 BEAM CLAMPS

A. Malleable black iron clamp for attachment to beam flange to 0.62” thick with a retaining ring and threaded rod of 3/8”, 1/2”, and 5/8” diameter. Furnish with a hardened steel cup point set screw.

2.4 INSERTS

A. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.5 ANCHORS

A. Use welding steel shapes, plates and bars to secure piping to structure.

2.6 FABRICATION

A. Design hangers without disengagement of supported pipe.

B. Provide copper plated hangers and supports for copper piping.

2.7 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

2.8 CONCRETE EQUIPMENT PADS

A. Provided by General Contractor. Mechanical Contractor is responsible to give pad dimensions to the General Contractor based on approved shop drawings.

2.9 EQUIPMENT STANDS

A. Use contractor fabricated stand consisting of structural steel members supported by pipe supports. All steel exposed to the weather to galvanized, painted or stainless steel.

2.10 EQUIPMENT CURBS, EQUIPMENT RAILS AND PIPE CURB ASSEMBLIES

A. Manufacturers:

1. Pate
2. Roof Products
3. ThyCurb
4. Vent Products
5. Custom Curb
6. Equipment manufacturer’s curbs constructed to match their equipment is acceptable if curb is approved by the National Roofing Contractors Association.

B. Roof curbs shall be constructed of not less than 18 gauge galvanized steel reinforced so it is structurally capable of supporting the intended load with no penetrations through the curb flashing, inside and outside corner sections that are mitered and continuously welded, lined minimum 1 ½" thick, 3 lb. density insulation, integral deck mounting flange, nominal 2" wood nailer, and galvanized steel counter flashing. Roof curbs to be internally reinforced. Curb heights shall be as indicated on drawings. Top of roof curbs shall be level, with pitch built into curb when deck slopes ¼" of an inch per foot or greater.

C. Roof mounted equipment rails shall be constructed of not less than 18 gauge galvanized steel reinforced so it is structurally capable of supporting the intended load, with welded corners, fully mitered cant with continuously welded seams. Rails shall be internally reinforced and have 2x4 or 2x6 wood nailer and galvanized steel counter flashing. Rail heights shall be minimum 8" above roof deck or as indicated on drawings. Rail length shall span a minimum of two roof joists or added structural support as indicated on drawings and shall not cantilever more than 12" Support shall be level at the top with pitch built-in when deck slopes 1/4 " per foot or greater.

D. Pipe curb assemblies shall be constructed of not less than 18 gauge galvanized steel reinforced so it is structurally capable of supporting the intended load, inside and outside corner sections that are mitered and continuously welded, lined with a minimum 1 ½" thick, 3 lb. density insulation, integral deck mounting flange, nominal 2" thick wood nailer, laminated acrylic clad thermoplastic cover with graduated step boots to accommodate size and quantity of pipes, fasten screws for cover, and stainless steel clamps for securing boots around piping. Curb heights shall be as indicated on drawings. Top of roof curbs shall be level, with pitch built into curb when deck slopes ¼" of an inch per foot or greater.

E. Roof curbs, equipment rails, and pipe curb assemblies mounted on standing seam metal roofing systems shall be by the roof manufacturer unless indicated otherwise on drawings.

PART 3 - EXECUTION

3.1 INSERTS

A. Provide inserts to General Contractor for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4".

3.2 PIPE HANGERS SUPPORTS, AND ANCHORS:

A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
1/2" to 1-1/4"	6'-6"	3/8"
1-1/2" to 2"	10'-0"	3/8"

2-1/2” to 3”	10'-0"	1/2"
4” to 6”	10'-0"	5/8"
8” to 12”	14'-0"	7/8"
14” and Over	20'-0"	1"
Nat. Gas Pipe (1/2”)	6’-0”	3/8”
Nat. Gas Pipe (3/4”)	8’-0”	3/8”
Nat. Gas Pipe (1” and over)	10’-0”	3/8”
PVC (All Sizes)	6'-0"	3/8"
Copper Pipe (1/2" to 1-1/4")	5’-0”	3/8"
Copper Pipe (1-1/2" & Over)	10'-0"	1/2"

B. Install hangers to provide minimum 1/2” space between finished covering and adjacent work.

C. Use hangers with 1-1/2” minimum vertical adjustment.

D. Support vertical piping with clamps secured to the piping and resting on the building structure at each floor. Piping 5” or greater, of lengths exceeding 30 feet, shall be additionally supported on base elbows secured to the building structure, with flexible supporting hangers provided at the top of riser to allow for expansion and contraction.

E. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

F. Support riser piping independently of connected horizontal piping.

G. Do not hang piping directly from a metal deck or run piping so it rests on the bottom cord of any truss or joist.

H. Install hangers and supports to provide for free expansion of the pipe system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets or floor stands. Fasten ceiling plates and wall brackets securely to the structure.

I. Install anchors where indicated on drawings. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops.

J. Support natural gas piping across roof with Dura-Block pipe supports or equal.

3.3 EQUIPMENT BASES AND SUPPORTS

A. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

B. Construct support of steel members. Brace and fasten with flanges bolted to structure.

C. Provide rigid anchors for pipes after vibration isolation components are installed.

D. Do not hang equipment directly from a metal deck.

END OF SECTION 23 05 29

SECTION 23 05 48 - VIBRATION ISOLATION

PART 1 - GENERAL

1.1 SCOPE

A. All work in this section is subject to the provisions of the General HVAC Requirements, and all other parts of the Contract Documents applicable to this Section of Work.

1.2 REFERENCES

A. ASHRAE - Guide to Average Noise Criteria Curves

1.3 QUALITY ASSURANCE

A. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition.

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 23 05 00.

B. Indicate vibration isolator locations, with static and dynamic load on each, on shop drawings and described on product data.

C. Submit manufacturer's installation instructions under provisions of Section 23 05 00.

1.5 CERTIFICATES

A. Submit manufacturer's certificate under provisions of Section 23 05 00 that isolators are properly installed and properly adjusted to meet or exceed specified requirements.

1.6 DESCRIPTION

A. Isolate all motor driven mechanical equipment from the building structure and from the systems which they serve to prevent equipment vibrations from being transmitted to the structure. Consider equipment weight distribution to provide uniform isolator deflections.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Use materials that will retain their isolation characteristics for the life of the equipment served. Use industrial grade neoprene for elastomeric materials.

B. All isolators shall be treated to resist corrosion. For isolation devices exposed to the weather or used in high humidity areas, hot dip galvanize steel parts, apply neoprene coating on all steel parts, or use stainless steel parts; include limit stops to resist wind.

C. Use isolators with a ratio of lateral to vertical stiffness not less than 1.0 or greater than 2.0.

2.2 VIBRATION ISOLATORS

A. Acceptable Manufacturers:

1. Mason Industries
2. Krueger Manufacturing
3. Peabody
4. Tech Products

B. Type A: Neoprene Pad

1. Neoprene waffle pad, 40 durometer with 16 gauge shims between layers
2. Mason Type W, WM or WMW

C. Type B: Neoprene Pad

1. Double deflection neoprene mount having a minimum static deflection of 0.35 inches. Cover all metal surfaces with neoprene to resist corrosion. Include friction pads on both top and bottom surfaces so mounts need not be bolted to the floor, but include bolt holes for those areas where bolting is required. For equipment such as close coupled pumps, include steel rails for use between the isolator and the equipment to accommodate equipment overhang.
2. Mason Type ND or DNR

D. Type C: Unhoused Spring with Neoprene

1. Combination freestanding, unhoused spring and neoprene with rib molded antifriction base. Include leveling bolts for securing to the equipment. Springs to be laterally stable under load and selected so they have an additional travel to solid equal to 50% of the rated deflection. Use height saving brackets when appropriate to the application.
2. Mason Type SLF

E. Type D: Restrained spring with neoprene

1. Combination spring and neoprene with rib molded base similar to type C, but with a housing that includes vertical limit stops to prevent spring extension when weight is removed such that the installed and operating heights are the same. Maintain a minimum clearance of ½" around restraining bolts, and between the housing and the spring, so as not to interfere with the spring action. Design isolator so limit stops are out of contact during normal operation. Use height saving brackets when appropriate to the application.

2. Mason type SLR

F. Type E: Spring Hanger with neoprene

1. Vibration hanger with steel spring and 0.3” deflection neoprene element in series. Use neoprene element molded with a rod isolation bushing that passes through the hanger box. Select spring diameters and size hanger box lower holes large enough to permit the hanger rod to swing through a 30 degree arc before contacting the hole and short circuiting the spring. Select springs so they have a minimum additional travel to solid equal to 50% of the rated deflection.
2. Mason type 30N

G. Type F: Precompressed spring hanger with neoprene

1. Vibration hanger similar to type E but precompressed to the rated deflection to keep the piping or equipment at a fixed elevation during installation. Hanger shall have release mechanism to free the spring after the installation is complete and the hanger is subjected to full load.
2. Mason type PC30N

H. Type G: Inertia Base

1. Rectangular structural beam or channel concrete form for floating foundation. Use perimeter steel members with a minimum depth equal to 1 ½ of the longest dimension of the base but not to exceed 12” or less than 6”.
2. Mason type KSL with type C isolators

I. Type H: Horizontal Thrust Restraint

1. Spring element in series with a neoprene pad
2. Thrust restraints to be used when air thrust exceeds 10% of equipment weight.
3. Mason type WB

2.3 FLEXIBLE PIPING CONNECTIONS

A. Acceptable Manufacturers

1. Mason, Flexonics, or Metraflex

B. Suitable for pressure, temperature and fluid involved.

C. Minimum pressure rating shall be 125 psig at the design temperature of the fluid.

D. Use minimum 12” length or length required to absorb ¾” lateral movement, whichever is greater.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Select vibration devices as indicated below or to provide not less than 95% isolation efficiency, whichever is greater.

Equipment Type	On Grade Type	On Grade Min. Defl. In.	Up to 20 Feet Type	Up to 20 Feet Min. Defl. In.	20 to 30 feet Type	20 to 30 feet Min. Defl. In.	40+ Feet Type	40+ Feet Min. Defl. In.
	----------Floor span or Column Spacing ----------							
Air Handling Units (Floor mounted; up to 5 hp)	C	0.35	C	0.75	C	0.75	C	0.75
Air Handling Units (Floor mounted; 7 ½ hp and over)	C	0.35	C	1.50	C	1.50	C	1.50
Suspended Centrifugal Blowers, Tubular Centrifugal, Axial, and Cabinet Fans (unless internally isolated)	175-224 RPM		E	3.50	E	4.50	E	4.50
	225-299 RPM		E	3.50	E	3.50	E	3.50
	300-364 RPM		E	2.50	E	2.50	E	2.50
	375-499 RPM		E	1.50	E	2.50	E	3.50
	500 RPM+		E	0.75	E	1.50	E	2.50

3.2 INSTALLATION

A. Provide flexible piping connections for all piping to rotating or reciprocating equipment mounted on vibration isolators. Flexible pipe connections are not required on any type of gas piping or with inline pumps.

B. Install vibration isolation devices to motor driven equipment in accordance with the manufacturer's installation instructions.

C. Do not allow installation practices to short circuit or bind any isolation device.

END OF SECTION 23 05 48

SECTION 23 05 93 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 SCOPE

A. All work in this section is subject to the provisions of the General HVAC Requirements, and all other parts of the Contract Documents applicable to this Section of Work.

1.2 WORK INCLUDED

A. Testing, adjusting and balancing of air and water side of heating, ventilating and air conditioning systems.

1.3 REFERENCE STANDARDS

A. Wisconsin Administrative Code – Chapter Comm 64.53

B. AABC – National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems

C. NEBB – Procedural Standards for Testing, Adjusting and Balancing or Environmental Systems

D. ASHRAE Handbook, 1999 HVAC Applications, Chapter 36, Testing, Adjusting and Balancing

1.4 DESCRIPTION

A. Provide total mechanical systems testing, adjusting, and balancing. Requirements include the balance of air and water distribution, adjustment of new and or existing systems to provide design quantities indicated on drawings, electrical measurement and verification of performance of all equipment, all in accordance with standards published by AABC or NEBB and in accordance with Wisconsin Administrative Code – Chapter Comm 64.53.

B. Test, adjust, and balance all air and hydronic systems so that each room, piece of equipment or terminal device is using quantities indicated on the drawings and in the specifications.

C. Accomplish testing, adjusting and balancing work in a timely manner with completion of work in the time stated in the Instruction to Bidders and in accordance with the completion schedule established for this project.

1.5 SUBMITTALS

A. Submit (4) sets of testing, adjusting and balancing reports bearing the seal and signature of the NEBB or AABC Certified Test and Balance Supervisor to Architect's office. The reports to be certified proof that the systems have been tested, adjusted and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed and are operating; and are an accurate record of all final quantities measured to establish normal operating values of the systems.

B. Provide the following information, forms and data:

1. General Information: Inside cover sheet identifying Test and Balance Contractor, Mechanical Contractor, and Project Name. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.
2. Provide full air system and hydronic system test results.
3. Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendation for correcting unsatisfactory performances and indicate whether modifications required are within the scope of the contract, are design related or installation related. List instrumentation used during testing, adjusting and balancing procedures.
4. Forms: Provide appropriate standard NEBB or AABC forms for each respective item and system. Fill out forms completely. Where information cannot be obtained or is not applicable, indicate same.

C. Products:

1. Provide all required instrumentation to obtain proper measurements. Application of instruments and accuracy of instruments and measurements to be in accordance with the requirements of NEBB or AABC Standards and Instrument manufacturer's specifications.

1.6 GENERAL PROCEDURES

A. Test and Balance contractor shall be responsible for obtaining any applicable construction addendums, construction bulletins, applicable change orders and approved shop drawings pertaining to this work.

B. Check all filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and belt tension, temperature controls for completion of installation and hydronic systems for proper charge and purging of air.

C. Do not proceed until systems are fully operational with all components necessary for complete testing, adjusting and balancing. Installing contractors are required to provide personnel to check and verify system completion, readiness for balancing and assist Testing and Balancing Contractor in providing specified system performance.

D. In areas containing ceilings, remove ceiling tile to accomplish testing and balancing work; replace all tile when work is complete and provide new tile to any tile damaged by this procedure.

E. Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary for adequate performance of procedures. Patch using materials identical to those removed, maintaining vapor barrier integrity and pressure rating of systems.

F. Contact the temperature control contractor for assistance in operation and adjustment of controls. Cycle controls and verify operation and set points. Include in report description of temperature control operation and deficiencies found.

G. Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock all memory stops.

H. Leave systems in proper working order, replacing belt guards, closing access doors and electric boxes, and restoring temperature controls to normal operating settings.

1.7 TESTING, ADJUSTING AND BALANCING PROCEDURES

A. Air System Balancing:

1. Identify each mechanical fan system by tag and location.
2. Identify each terminal device by tag and as to location and fan system
3. In air systems employing filters, blank off sufficient filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter.
4. Measure, adjust and record fan speed to design requirements.
5. Measure and record motor full load amperage and calculated BHP.
6. Measure and record static air pressure conditions across fans, coils and filters.
7. Measure, adjust and record all main supply air ducts, return air ducts and zones to proper design airflows.
8. Measure and record all air temperatures; supply air, return air, mixed air, and outside air including dry and wet bulb temperatures.
9. Adjust outside air, return air and relief air dampers for design conditions at both the minimum and maximum settings and record both sets of data.
10. Balance variable air volume systems at full cooling flow rate, minimum flow rate, and heating flow rate; record all data.
11. Balance all modulating dampers at extreme conditions and record both sets of data.
12. Adjust grilles, diffusers and registers to achieve proper air distribution patterns and uniform space temperatures free from objectionable noise and drafts with the capabilities of the installed system.
13. Provide fan and motor drive sheave adjustments necessary to obtain design performance. Include in scope of services cost of new sheaves and belts if it becomes necessary to attain design performance.
14. Adjust fan drives, dampers, terminals and controls to maintain pressure relationships in areas or rooms designed to maintain positive, negative or neutral air pressures with respect to adjacent spaces, as indicated by the design air quantities.

15. The Contractor shall include in the bid the cost of new sheaves and belts if it becomes necessary to change the drives during balancing of system.
16. Final air system measurements to be within the following range of specified cfm:

a.	Fans	0% to +10%
b.	Supply grilles, registers, diffusers	0% to +5%
c.	Return/exhaust grilles	0% to -5%
d.	Room pressurization air	-5% to +5%

e. NOTE: Airside of system must be balanced completely before starting water balance.

1.8 QUALITY ASSURANCE

A. All work performed under this Section shall be under the direction of the supervisor who is designated and qualified under the certification requirements of NEBB and/or AABC.

B. Coordinate system balancing requirements with Section 23 09 93, 23 09 00 and Division 26.

C. Acceptable Contractors:

1. Balance Technologies
2. Badger Balancing
3. Balco Balancing
4. ESA
5. Midwest Fluid Balancing
6. Professional Systems Analysis

END OF SECTION 23 05 93

SECTION 23 07 00 - HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the contract, including General and Supplementary Conditions and Division 01 specification sections apply to work of this Section.

1.2 DEFINITIONS

A. Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk through tunnels shall be considered as exposed.

1.3 QUALITY ASSURANCE

A. Substitution of Materials: Refer to General Conditions of the Contract.

1.4 SHOP DRAWINGS

A. Submit a schedule of all insulating materials to be used including adhesives, fastening methods, fitting material and intended use of each material. Include manufacturer's data sheets indicating density, thermal characteristics, jacket type and manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 GENERAL

A. All insulation, facings, mastics and tapes installed within the building shall have a composite flame and smoke hazard rating as tested by procedure ASTM E-84-80, NFPA- 255 and UL-723, not exceeding 25 flame spread or 50 smoke developed.

B. All insulation, facings, mastics, sealants and tapes shall be free of asbestos.

C. Duct insulation to be applied after duct tape and adhesive and/or duct sealant is applied by sheet metal contractor. Allow sufficient time for tape and adhesive to dry and/or duct sealant to cure before insulating ducts.

2.7 DUCTWORK

A. Type of ductwork and type of insulation:

1. All fresh air intake ductwork. = Rigid Board
2. All combustion air intake ductwork. = Duct Wrap

3. All exhaust air ductwork from automatic exhaust air damper or self-acting damper to roof or wall termination except acoustically lined ductwork. = Rigid Board
4. All mixing plenum ductwork. = Rigid Board
5. All supply air ductwork from each air handling unit installed within the mechanical equipment room (except lined ductwork). = Rigid Board
6. All supply air ductwork from each air handling unit installed outside of the mechanical equipment room (except ductwork exposed within an air conditioned space and acoustically lined ductwork). = Duct Wrap
7. All supply air ductwork from each air handling unit installed above cloud ceilings (except acoustically lined ductwork). = Duct Wrap
8. All ductwork installed above building envelope insulation through cold attic location. = Rigid Board (Rvalue of 12 minimum)

B. Rigid Board insulation:

1. Indoor ductwork: Maximum two inch (2”) thick Owens-Corning, Manville, Certainteed or Knauf fiberglass duct insulation with factory applied aluminum foil reinforced kraft vaporproof facing. The entire assembly shall provide a minimum “installed R value” of 6 for all indoor ductwork.
2. Outdoor ductwork: Maximum two and one half inch (2.5”) thick Owens-Corning, Manville, Certainteed or Knauf fiberglass duct insulation with factory applied aluminum foil reinforced kraft vaporproof facing. The entire assembly shall provide a minimum “installed R value” of 12 for all outdoor ductwork.
3. Insulation shall cover all duct flanges for a smooth exterior finish.
4. The insulation shall be fastened to the duct with fire resistive adhesive (100% coverage) and Graham welding pins located on a maximum of 18” centers and not less than 3” from each edge or corner of the board. Stick-Klip fasteners may be used in lieu of welding pins providing they are installed in accordance with the manufacturer’s recommendations on a clean surface with Type S adhesive.

C. Duct Wrap Insulation:

1. Maximum two inch (2”) thick Owens-Corning, Manville, Certainteed or Knauf fiberglass blanket type duct insulation with factory applied reinforced foil vapor barrier facing and a 2” stapling and taping flange.
2. Insulation shall be installed with facing outside so that tape flaps overlap at opposite end. Insulation shall be tightly butted. Seams shall be stapled 6” on center. Seal joints with pressure sensitive tape matching the facing.
3. Where rectangular ducts are greater than 24” in width insulation shall be secured to the bottom of the duct with mechanical fasteners spaced on 18” centers to prevent sagging of insulation.
4. Seal all tears, punctures and other penetrations of facing with tape or mastic to provide a vapor tight system installation.
5. The entire assembly shall provide a min. “installed R value” of 6.

2.8 DUCTWORK INSTALLED WITHIN MECHANICAL ROOMS

A. Cover rigid board duct insulation installed within mechanical rooms with white semi-gloss or aluminum texture, 13 ply Venture Clad or equal duct covering with self-bonding, adhesive backing. End to end joints must be lapped a minimum of 2” for a watertight installation.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install materials after ductwork has been tested and approved.

B. Clean surfaces for adhesives.

3.2 INSTALLATION

A. Install materials in strict accordance with manufacturer's instructions.

1. NOTE: Contractor shall verify with manufacturer the proper initial 'Heat-Up' method for curing of binders in high temperature insulation.

B. Provide insulation with vapor barrier when air conveyed may be below ambient temperature.

C. Insulation jackets and accessories shall only be installed under ambient temperatures recommended by the manufacturer of the material.

END OF SECTION 23 07 00

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SECTION 23 09 00 - BUILDING AUTOMATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 RELATED WORK

A. 23 09 93 Control Sequences

B. Division 26 Electrical

1.3 DEFINITIONS

A. BACnet: Building Automation and Control Network Standard (ASHRAE 135)

B. BAS: Building Automation System

C. DDC: Direct digital control.

D. I/O: Input/output.

E. IP: Internet Protocol

F. MS/TP: Master slave/token passing.

G. PC: Personal computer.

1.4 SYSTEM DESCRIPTION

A. The Building Automation System (BAS) manufacturer shall furnish and install a fully integrated building automation system, incorporating direct digital control (DDC) for all equipment and systems as herein specified.

B. System shall be an HTML5-based (non-Java) system and shall utilize BACnet communication according to ASHRAE standard ANSI/ASHRAE 135 for interoperability with smart equipment and for the main BACnet/IP communication trunk to the BAS Server.

C. All necessary software (open license), hardware, firmware, operating equipment, devices and system components required for the system shall be provided by the BAS Contractor whether or not specifically itemized, in order to provide a complete system within the intent of this specification.

D. Provide Owner with field controller level software for full system access and editability. The head end shall not be locked in any way.

E. The building management system shall support any JDBC (Java DataBase Connectivity) compliant engine including Apache Derby, Microsoft SQL, MySQL, PostgreSQL and Oracle 12c, MS Access® MySQL 5.6, MS SQL Server 2012 Express R2 & 2008 Express R2, MS SQL Server 2012 R2 & 2008 R2, PostgreSQL 8.4 and 9.4 Oracle® 11gR2. Ownership of the database software shall be solely assigned to the Owner. The installing contractor shall not retain ownership of the database software, any required licenses or associated data.

F. Provide the tools to create, edit, simulate, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Ownership of the logic/programming software shall be solely assigned to the building owner. The installing contractor shall not retain ownership of the logic/programming software, any required licenses or associated data.

G. All project-specific software and documentation shall become Owner's property. This includes, but is not limited to: Graphics, Record drawings, Database, Application programming code, and Documentation.

1.5 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

a. Water Temperature: Thermistor plus or minus 0.3 deg. F; RTD and Transmitter plus or minus 0.5 deg. F.
b. Water Flow: Plus or minus 2 percent of full scale at 77 deg. F and pure water.
c. Plus or minus 6 percent whole range temperature and glycol.
d. Water Pressure: Less than plus or minus 1 percent of measuring range.
e. Space Temperature: Plus or minus 1 deg F.
f. Ducted Air Temperature: Plus or minus 0.9 deg F.
g. Outside Air Temperature: Plus or minus 0.7 deg F.
h. Dew Point Temperature: Plus or minus 3 deg F.
i. Temperature Differential: Plus or minus 0.25 deg F.
j. Relative Humidity: Plus or minus 2 percent.
k. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
l. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
m. Airflow (Terminal): Plus or minus 10 percent of full scale.
n. Air Pressure (Space): Plus or minus 0.01-inch wg.

o. Air Pressure (Ducts): Plus or minus 0.04-inch wg.
p. Carbon Monoxide: Plus or minus 5 percent of reading.
q. Carbon Dioxide: 3 percent of the reading, plus or minus 50 ppm.
r. Electrical: Plus or minus 5 percent of reading.

1.6 SUBMITTALS

A. Product Data:

1. Include manufacturer's technical literature for each control device and software. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.
2. Where there are options on the accuracy, signals, covers, ranges, etc., indicate on the data sheet which options are being selected.
3. Schedule of dampers including size, leakage, and flow characteristics.
4. Schedule of valves including flow characteristics.

B. Shop Drawings:

1. Detail system assemblies and indicate device locations, wiring connections, associated control panel connections and sequence of operations to be executed by the DDC program.
2. Bill of materials for all devices, controller, accessories, and software indicating quantity, manufacturer, model number and description. The description shall include options that are chosen for that device, such as accuracy, signals, covers, ranges.
3. Schematic flow diagrams showing fans, pumps, equipment, coils, dampers, valves, and control devices.
4. Written description of sequence of operation.

C. Wiring Diagrams:

1. Power, signal, and control wiring, differentiating clearly between manufacturer-installed and field installed wiring.

D. DDC System Hardware:

1. Wiring diagrams for control units with termination numbers.
2. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.

E. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ANSI/ASHRAE Standard 135 “BACnet – A Data Communication Protocol for Building Automation and Control Networks” where indicated.

F. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

G. Operation and Maintenance Data:

1. For HVAC instrumentation and control system to include in maintenance manuals. In addition to items specified elsewhere in Division 23 include the following:

a. Interconnection wiring diagrams with identified and numbered system components and devices.
b. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

1.7 QUALITY ASSURANCE

A. Provide principal digital temperature control equipment and materials as manufactured by a single manufacturer.

B. All work shall be installed by mechanics, electricians and technicians directly employed by the BAS manufacturer or by an authorized independent manufacturer's field office.

C. The BAS manufacturer shall be responsible for the proper installation and operation of the BAS.

D. Use only UL labeled products which comply with NEMA Standards. Electrical components and installation to meet all requirements of the electrical sections (Division 26) of project specifications.

E. Comply with ANSI/ASHRAE Standard 135 “BACnet – A Data Communication Protocol for Building Automation and Control Networks” where indicated.

F. Store equipment and materials inside and protected from weather.

G. All materials and equipment used shall be standard components, regularly manufactured for HVAC applications. All systems and components shall have been thoroughly tested and proven in actual use.

H. The installation of the control system shall be performed under the direct supervision of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation or identification number and sequence of operation all bearing the name of the manufacturer. The installing manufacturer shall certify in writing, that the shop drawings have been prepared by the equipment manufacturer and that the equipment manufacturer has supervised their installation. In addition, the equipment manufacturer shall certify, in writing, that the shop drawings were prepared by their company and that all temperature control equipment was installed under their direct supervision.

I. BAS Contractor shall be responsible for all BAS and Temperature Control wiring and conduit for a complete and operable system.

J. BAS Contractor shall provide login information to the Engineer at project completion for a review of the graphical interface and monitoring of the installed system operation. The login shall be for viewing purposes only.

1.8 WIRING

A. All wiring and data cabling shall be done in accordance with all requirements of Division 26 and 27 as well as all local and national codes.

B. All electrical wiring required for electrical interlocking, fan timers, selector switches, speed switches, damper motors, control panels, etc., and all wiring required for the complete installation of the BAS shall be by the BAS Contractor. The only wiring by the Electrical Contractor shall be the primary power wiring from panelboards to starters and/or VFD's and from starters and/or VFD's to motors and power wiring to electrical resistance heating equipment (see E-Series drawings). All other control-related power wiring for the complete mechanical system shall be by the BAS Contractor.

C. Power wiring and conduit for temperature control panels shall be furnished and installed by the BAS Contractor and shall be connected to separate circuit breakers at the nearest available panelboards. See Electrical drawings and coordinate with the Electrical Contractor.

D. Power shall be wired from emergency power equipment branch panels for control panels serving boilers, pumps, and other equipment on emergency power. See Electrical drawings and coordinate with the Electrical Contractor.

E. Data cabling and conduit for temperature control devices and/or panels shall be furnished and installed by the BAS Contractor and shall be connected to building data system routers and/or switches. Coordinate requirements with the data cabling contractor and the Owner's I.T. manager.

1.9 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate equipment with the Electrical Contractor to achieve compatibility with motor starters and annunciation devices.

1.10 WARRANTY

A. Provide all services, materials and equipment necessary for the successful operation of the entire BAS system for a period of one year after final acceptance of the system.

B. The adjustment, required testing, and repair of the system includes all computer equipment, transmission equipment and all sensors and control devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. American Auto-matrix Aspect installed by J&H Controls.

2.2 BAS NETWORK

A. Provide a primary backbone network between the Building Level System Controllers, BAS Server and Operator Workstations based upon BACnet/IP. Ethernet Network switches shall be placed throughout the building as required.

B. Building Level System Controllers shall be used for the central plant and air handlers as indicated and shall reside on the backbone network.

C. The Building Level System Controllers shall be able to support one of several sub-network protocols that may be needed depending on the type of equipment or application.

D. Advanced Application Controllers and Application Specific Controllers can reside on the primary backbone network or on a sub-network.

E. Provide all communication media, data cabling, connectors, repeaters, bridges, switches, and routers necessary for the internetwork.

2.3 OPERATOR INTERFACES

A. Operator Workstation hardware (OWS):

1. Personal computer operator workstations shall be utilized for command entry, information management, system monitor, alarm management and database management functions. All real-time control functions shall be resident in the Building Controllers to facilitate greater distribution, fault tolerance and reliability of the building automation control.

a. Furnish and install head end hardware in Owner’s server room or as directed by the Owner. Furnish and install software on a designated PC workstation as directed by the Owner.

2. Server/Operator Workstation Setup (Unlimited Users and Customizable or Predefined Privilege Sets)

a. System software shall be based on a server/thin-client architecture, designed around the open standards of web technology. The control system server shall be accessed using a Web browser over the control system network, the owner's local area network and (at the owner's discretion) over the Internet. No special software other than a Web browser shall be required to access graphics, point displays, and trends, configure trends, configure points and controllers, or to download programming into the controllers.
b. System shall use BACnet protocol for communication between the control modules and web server. Communication between the web server and the user's browser shall be HTTP or HTTPS protocol utilizing HTML5. Use of Adobe Flash technology is not acceptable. Web pages generated by this server shall be compatible with the latest versions of Microsoft Internet Explorer or Edge, Google Chrome, Mozilla Firefox, and Apple Safari browsers. Any of these supported browsers connected to the server shall be able to access all system information.
c. The building management system shall support unlimited concurrent users. Each user shall be capable of having full access and functionality within the system.
d. Each operator shall be required to log onto the system with a username and password to view, edit, add, or delete data. The username and password combination shall define accessible viewing, editing, adding, and deleting privileges for that operator. The system shall be capable of being configured with individual user privileges for each operator or with preset user groups that operators are placed into.

3. Phone/Tablet Versatility (No Additional Program or App Required)

a. Mobile devices shall be recognized by the web server and shall supply the appropriate system content as needed including graphics and all application software. System web pages shall be accessed via Microsoft Internet Explorer or Edge, Google Chrome, Mozilla Firefox, or Apple Safari browsers. The user environment on a mobile device shall be the same as the user environment via access of the system from a web browser on a personal computer or laptop. No program or mobile device app shall be required to interact with the system via the mobile device.

B. Operator Interface Software:

1. Operator interface software shall minimize operator training through the use of user-friendly and interactive graphical applications, on-line help, and industry standard application software. Interface software shall simultaneously communicate with and share data between connected building level networks.
2. Provide a graphical user interface that shall minimize the use of keyboard through the use of a mouse or similar pointing device, with a "point and click" approach to menu selection and a "drag and drop" approach to inter-application navigation.
3. The navigation shall be user friendly by utilizing "forward & back" capability between screens and embedded hyperlinks to open graphics, documents, drawings, etc.

4. The software shall provide a multi-tasking type environment that allows the user to run several applications simultaneously.
5. The software shall provide, as a minimum, the following functionality:

    a. Real-time graphical viewing and control of the BAS environment.
    b. Reporting of both real-time and historical information.
    c. Scheduling and override of building operations.
    d. Collection and analysis of historical data.
    e. Point database editing, storage and downloading of controller databases.
    f. Utility for combining points into logical Point Groups. The Point Groups shall then be manipulated in Graphics, trend graphs and reports in order to streamline the navigation and usability of the system.
    g. Alarm reporting, routing, messaging, and acknowledgment.
    h. Definition and construction of dynamic color graphic displays.
    i. On-screen access to User Documentation, via online help or PDF-format electronic file.
    j. Automatic database backup at the operator interface for database changes initiated at Building Controllers.
    k. Display dynamic trend data graphical plot.
    l. Must be able to run multiple plots simultaneously.
    m. Program editing.

6. Security: Operator-specific password access protection shall be provided to allow the administrator/manager to limit users' workstation control, display and data base manipulation capabilities as deemed appropriate for each user, based upon an assigned password.
7. The operator interface software shall also include an application to track the actions of each individual operator, such as alarm acknowledgement, point commanding, schedule overriding, database editing, and logon/logoff. The application shall list each of the actions in a tabular format and shall have sorting capabilities based on parameters such as ascending or descending time of the action, or name of the object on which the action was performed. The application shall also allow querying based on object name, operator, action, or time range.
8. Dynamic Color Graphics application shall include the following:

    a. Shall include graphic editing and modifying capabilities.
    b. A library of standard control application graphics and symbols must be included.
    c. Shall be able to command points directly off graphics application.
    d. Graphic display shall include the ability to depict real-time point values dynamically with animation, picture/frame control, symbol association, or dynamic informational text-blocks.
    e. Graphics shall be capable of displaying the status of points that have been overridden.

9. Reports shall be generated on demand or via pre-defined schedule, and directed to CRT displays, printers or file.

10. Scheduling and override

    a. Provide a calendar type format for simplification of time and date scheduling and overrides of building operations. Schedule definitions reside in the PC workstation and in the Building Controller to ensure time equipment scheduling when PC is off-line, PC is not required to execute time scheduling. Provide override access through menu selection, graphical mouse action or function key. Provide the following capabilities as a minimum:

        1) Daily, Weekly, and Monthly schedules
        2) Ability to combine multiple points into a logical grouping (Zone) for ease of scheduling (e.g., Building 1 lights)
        3) Ability to combine multiple groups of points into a common collection (Event) for scheduling (e.g., Building 1 and Parking Lot A lights)
        4) Schedule predefined reports that can be sent to a printer, hard drive location, or emailed.

11. Collection and Analysis of Historical Data

    a. Provide trending capabilities that allow the user to easily monitor and preserve records of system activity over an extended period of time. Any system point may be trended automatically at time-based intervals or change of value, both of which shall be user-definable. Trend data shall be collected and stored on hard disk for future diagnostics and reporting.
    b. Panels shall have a trending level above which the data will be automatically uploaded to the BMS server to prevent overwriting the data in the field panel.
    c. Trend data reports shall be provided to allow the user to view all trended point data. Reports may be customized to include individual points or predefined groups of selected points.
    d. Provide additional functionality that allows the user to view real-time trend data on trend graphical plot displays. The dynamic graphs shall continuously update point values. At any time, the user may redefine sampling times or range scales for any point.

12. Integral System Documentation

    a. All project record documents shall reside within the building management system. The documents must be embedded within the associated graphics for the equipment or system. The user shall be able to access the relevant documents via clicking on a link on the respective graphic. For graphics with multiple links, the links shall be organized in an expandable tree format with the links grouped in a logical manner. The documents shall be accessed without the operator having to exit the building management system operator interface software. It is not acceptable to simply save files on the server/operator workstation hard drive.

b. The following documents must be embedded within the system graphics at a minimum (see below image for sample layout):

1) Equipment O&M's (PDF from equipment manufacturer)
2) Controller and control device cut sheets (PDF)
3) Control as-built documentation (PDF) including control diagrams, wiring diagrams, etc.
4) System or Equipment As-Built Sequence of Operations

13. Dynamic Color Graphic Displays

a. Capability to create color graphic floor plan displays and system schematics for each piece of mechanical equipment, including, but not limited to, air handling units, chilled water systems, hot water boiler systems, and room level terminal units.
b. The operator interface shall have the ability allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection, point alarm association, or text-based commands. Graphics software shall permit the importing of AutoCAD or scanned pictures for use in the system.
c. Dynamic temperature values, humidity values, flow values and status indication shall be shown in their actual respective locations within the system schematics or graphic floor plan displays and shall automatically update to represent current conditions.
d. At a minimum, all items listed under "control devices for each unit" within each control sequence in Section 23 09 93 shall be shown graphically as a point for each piece of equipment. All graphics shall be coordinated with and verified by the Owner prior to or at the time the graphics are being produced.
e. All system and space setpoints shall be both viewable and editable on each of the graphical displays.
f. In addition to standard equipment graphics, each system or piece of equipment controlled shall be provided with a live graphic that shows all inputs and outputs to the system/equipment controller. The graphic shall include a realistic depiction of the controller (same model and type as installed) with labels indicating all points connected to the inputs and outputs. The live data associated with the points shall also be shown and shall be distinguished by a different color from the remaining information on the graphic.
g. All graphics pages shall be provided with notetaking functionality. There shall be a notes icon on each page that brings up a graphic that allows the user to type in customized text-based notes. The notes shall be able to record equipment status, user adjustments, etc. The user shall have the ability to mark the notes as important which shall be denoted on the main graphic page by changing the "Notes" letters red. Users shall also be able to mark notes as read which will turn the "Notes" letters back to the default color.

14. Custom 3D Graphics Representing Installed Equipment

a. All graphics shall be 3D and shall graphically represent the system/equipment controlled. Two-dimensional or single line type graphics and diagrams are not acceptable. All sensors and devices including coils, valves, dampers, etc. shall be shown on the graphics. The devices shown shall be 3D and shall be a realistic depiction of the actual item.
b. All live data shall be easily identifiable via text in a color other than the default text color used.
c. Links shall be provided on each graphic to allow the user to access graphics for associated systems and equipment. For example, an air handling unit shall include graphics to the chiller plant and boiler plant serving the air handling unit as well to the floor served by the equipment. Likewise, each terminal unit graphic shall contain links to the systems serving it as well as the associated floor plan. Interfaces to equipment such as chillers, boilers, variable frequency drives, etc. shall be available for each system. The user shall easily be able to move throughout the system without having to frequently go back to the home screen or use the navigation tree.
d. Information available via equipment interfaces shall not simply be listed in table format. Instead, this information shall be displayed in graphical format.
e. All setpoints and control points requiring adjustability shall be accessible via the system or equipment graphic.

15. Equipment Dashboards and Summary Graphics

a. Summary graphics shall be provided for all equipment and systems such as a central heating or cooling plant and main pieces of equipment such as air handling units. The dashboards and summary graphics shall organize data so that the user can easily access relevant data and see snapshots of equipment operation. Dashboards shall also show information such as system efficiency, energy usage, etc. These graphics shall be provided in addition to system graphics referenced earlier within this document. Specific information to be detailed on each dashboard and graphic shall be coordinated with the owner prior to installation.

16. Time Lapse (Graphics Playback Tool):

a. Operator shall be able to “replay” any graphic in the system to see how key values changed over an operator-selected period of time. Operator shall be able to select the starting date/time for this display and the end date/time or the display period. System shall then display the graphic as it would have looked at the beginning of that period, displaying key data, dynamic colors, etc. based upon values recorded at the start time. When the operator starts the replay the graphics and key values shall dynamically change to produce the effect of “fast forwarding” through the designated period of time. Once the system has been operational for at least 30 days, the contractor shall demonstrate that up to 24 hours of data from within the last 30 days can be replayed on any graphic page. Owner’s representative shall choose the graphic pages for this demonstration at the time of the demonstration.

17. System Auditing

    a. All users accessing the system shall have their actions recorded. Information recorded shall include user login and logout times and dates and all user system modifications with before and after values detailed. The system shall have the ability to report user activity based on individual and/or date and time.

C. System Configuration & Definition

1. A “Collapsible tree” dynamic system architecture diagram/display application of the site-specific BMS architecture showing status of controllers, PC workstations and networks shall be provided. This application shall include the ability to add and configure workstations, Building Controllers, as well as third-party integrated components. Symbols/Icons representing the system architecture components shall be user-configurable and customizable, and a library of customized icons representing third-party integration solutions shall be included. This application shall also include the functionality for real-time display, configuration and diagnostics connections to Building Controllers.
2. Network wide control strategies shall not be restricted to a single Building Controller but shall be able to include data from any and all other network panels to allow the development of Global control strategies.
3. Provide automatic backup and restore of all Building Controller databases on the workstation hard disk. In addition, all database changes shall be performed while the workstation is on-line without disrupting other system operations. Changes shall be automatically recorded and downloaded to the appropriate Building Controller. Changes made at the user-interface of Building Controllers shall be automatically uploaded to the workstation, ensuring system continuity.
4. System configuration, programming, editing, graphics generation shall be performed on-line.
5. User shall be able to edit point configuration online within a dedicated editor application that is part of the operator interface software. The editor shall allow the user to create, view existing, modify, copy, and delete points from the database.
6. The point editor shall have the capability to assign “informational text” to points as necessary to provide critical information about the equipment.
7. The point editor shall also allow the user to configure the alarm management strategy for each point. The editor shall provide the option for editing the point database in an online or offline mode with the Building Controllers.

8. Control program configuration shall be available to the user within a dedicated control program editor application included in the operator interface software. The editor shall allow for creation, modification and deletion of control programs. The editor shall include a programming assistance feature that interactively guides the user through parameters required to generate a control program. The editor shall also include the ability to automatically compile the program to ensure its compatibility with the Building Controllers. The editor shall provide the option for editing the control programs in an online or offline mode, and also the ability to selectively enable or disable the live program execution within the Building Controllers.
9. Users shall have the ability to view the program(s) that is/are currently running in a Building Controller. The display shall mark the program lines with the following: disabled, comment, unresolved, and trace bits.

D. Alarm Management

1. Provide alarm notifications for all major HVAC equipment including air handling units, heat pumps, chillers, boilers, pumps, fans, rooftop units, etc. Verify alarm notification requirements with the Owner. Typical alarm notifications shall include but not be limited to fan/pump failures, temperature setpoint failures, building pressure, hot water temperature, chilled water temperature, alarms from manufacturer-provided BACnet controllers, economizer fault detection and diagnostics (FDD) in accordance with IECC, etc.
2. Alarm Routing shall allow the user to send alarm notification to selected printers, email addresses, text message addresses or workstation location(s) based on time of day, alarm severity, or point type.
3. Alarm messages shall be customizable for each point, or each alarm priority level, to display detailed instructions to the user regarding actions to take in the event of an alarm.

E. Remote notification of messages

1. Operator Interface software shall be configured to send out messages to phones, text messaging devices, and email accounts based on a point's alarm condition.
2. System must be configurable to send messages to an escalation list so that if the first device does not respond, the message is sent on to the next device after a configurable time has elapsed.
3. Message detail shall be configurable on a per user basis.

2.4 REMOTE WEB APPLICATION OPERATOR INTERFACE

A. The BAS shall provide a web based graphical interface that allows users to access the BAS data via the Internet, extranet, or Intranet. The interface shall use HTML based ASP pages to send and receive data from the BAS to a web browser.

B. Furnish and install a web server computer complete with the most current operating system software.

C. Access to the web interface shall be password protected. A users rights and privileges to points and graphics shall be the same as those assigned at the OWS.

D. All graphics available at the OWS shall be available to users via a web browser.

E. The web-based interface shall provide the following functionality to users, based on their access and privilege rights:

F. Logon Screen – allows the user to enter their username, password and Domain name for logging into the web server.

G. Alarm Display – a display of current BAS alarms to which the user has access shall be displayed. Users shall be able to acknowledge and erase active alarms, and link to additional alarm information including alarm messages, and informational and memo text. Any alarm acknowledgements initiated through the web interface shall be written to the BAS central workstation activity log.

H. Graphic Display – display of system graphics available in the BAS workstation shall be available for reviewing over the web browser. A graphic selector list shall allow users to select any graphics to which they have access. Graphic displays shall automatically refresh with the latest change of values. Users shall have the ability to command and override points from the graphic display as determined by their user accounts rights.

I. Point Details – users shall have access to point detail information including operational status, operational priority, physical address, and alarm limits, for point objects to which they have access rights.

J. Point Commanding – users shall be able to override and command points they have access to via the web browser interface. Any commands or overrides initiated via the web browser interface shall be written to the BAS central workstation activity log.

K. Remote Communications: Provide a communication port for connection to the BAS network for remote web based communications. Provide coordination with the Owner for addressing and router configuration on both ends of the remote network.

L. The web server licensing options shall allow concurrent access by 5 browser connections.

M. Internet connections, ISP services, as well as necessary firewalls or proxy servers shall be provided by the BAS Contractor for the duration of the warranty period as required to support the web access feature.

2.5 GRAPHICS

A. Floor Plan Graphics

1. The BAS contractor shall request floor plans to be used as a background for a floor graphic.

2. If the floor plan is too big for the Graphical screen, provide a zoom feature or break the floor down into areas.
3. The floor plan shall, at a minimum, indicate each zone temperature setpoint and current temperature.

B. Equipment Graphics

1. The BAS Contractor shall provide a graphical screen for each individual air handling unit, pumping system, heating system, cooling system and terminal unit. Each graphic shall accurately depict the system components in a schematic format and shall include the setpoint and actual condition of all available temperature, pressure, flow and status points in the system.
2. For each piece of equipment indicated on the graphics, also provide text description of the area or system served. For example, “AHU-1 (East Classrooms)”, “RE-1 (AHU-1 Relief)”, etc.
3. Adjustable or override points shall be clearly displayed and shall be capable of being adjusted without leaving the graphics page.
4. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in or shall only require widely available no-cost plug-ins (such as Active-X or Adobe Flash). Ownership of the graphics software (including tools required for creating, editing and viewing) shall be solely assigned to the building owner. The installing contractor shall not retain ownership of the graphics software, any required licenses or associated data.
5. The installing contractor shall furnish a complete library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. This library also shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library shall be furnished in a file format compatible with the graphics generation package program.

2.6 STANDARD APPLICATION PROGRAMS

A. Morning warm up:

1. The system shall start at a predefined time prior to the system entering the occupied cycle of operation to facilitate the raising or lowering of the building temperature to bring the building back to occupied temperature.

B. Optimal start:

1. The system shall calculate the optimal time to start the morning warm up process to assure that the building reaches occupied temperature as close to the occupied time as possible.

C. Scheduled occupied/unoccupied:

1. The system shall enter occupied or unoccupied cycle as determined by a time of day, day of week schedule. Unoccupied mode shall include setback/setup temperature setpoints,

D. Occupancy Stand-by:

1. The system shall enter a stand-by mode during the scheduled occupied cycle as determined by a room occupancy sensor. Room temperature setpoint shall remain at the occupied setting while VAV boxes are allowed to modulate to the fully closed position when the space temperature is satisfied. Unit ventilator outside air dampers shall be allowed to fully close in stand-by mode. The room occupancy sensor is furnished and installed by the Electrical Contractor. Interlock wiring between the sensor and the controller is furnished and installed by the BAS Contractor.

E. Enthalpy economizer:

1. Whenever the outdoor air total energy is below the return air total energy and there is a call for cooling the system shall allow the outside air dampers to modulate prior to allowing mechanical cooling to activate.
2. The outside air damper shall return to minimum whenever the outside air total energy is above the return air total energy.
3. Whenever the system is operating in economizer mode, air handling unit chilled water and hot water coil control valves shall remain closed. Direct expansion cooling systems shall be disabled.

F. Dead band:

1. Where used to control both heating and cooling, zone temperature controls shall provide a temperature range or dead band within which the supply of heating and cooling energy to the zone is capable of being shut off or reduced to a minimum.

G. Night set-back:

1. Whenever the system is in the unoccupied cycle the room heating temperature setpoint shall be set-back to a reduced night temperature. The night set-back temperature shall be globally or individually set through the BAS.

H. Night set-up:

1. Whenever the system is in the unoccupied cycle the room cooling temperature setpoint shall be set-up to an increased night temperature. The night set-up temperature shall be globally or individually set through the BAS.

I. Supply air reset:

1. The system shall reset the supply air temperature setpoint based on the reheat coil valve position of each vav box served by the system. The DDC control program shall reset the supply air temperature from 55 deg. F. to 65 deg. F. The supply air temperature setpoint shall be reset up whenever all reheat coil valves are open at least 15%. The supply air temperature setpoint shall be reset down whenever any one of the reheat coil valves is fully closed.

J. Static pressure reset:

1. The system shall reset the static pressure setpoint based on the damper position of each vav box served by the system. The DDC control program shall gradually reset the static pressure setpoint down whenever all vav boxes are no more than 75% open. The DDC control program shall gradually reset the static pressure setpoint up whenever any vav box reaches 90% open.
2. The static pressure shall reset between minimum and maximum setpoints in increments of 0.1” water column at 10-minute intervals. Obtain minimum and maximum static pressure setpoints from the balancing contractor.

K. Pressure differential reset:

1. The system shall reset the pressure differential setpoint based on the automatic control valve position of each heating or cooling unit served by the system. The DDC control program shall gradually reset the pressure differential setpoint down whenever all control valves are no more than 80% open. The DDC control program shall gradually reset the pressure differential setpoint up whenever any one of the valves reaches 90% open.
2. The pressure differential setpoint shall reset between minimum and maximum setpoints in increments of 0.5 psig at 10-minute intervals. Obtain minimum and maximum pressure differential setpoints from the balancing contractor.

2.7 BUILDING LEVEL SYSTEM CONTROLLERS

A. Provide this type of controller for controlling:

1. Air Handling Units.
2. Integration to auxiliary systems such as Lighting, Power Monitoring, etc.

B. BACnet Compliance: Control units shall use ASHRAE 135 protocol.

C. Modular, comprising processor board with programmable, nonvolatile, random-access memory; and backup power source.

D. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.

E. Stand-alone mode control functions operate regardless of network status. Functions include the following:

1. Global communications.
2. Discrete/digital and analog I/O.
3. Monitoring, controlling, or addressing data points.
4. Software applications, scheduling, and alarm processing.
5. Testing and developing control algorithms without disrupting field hardware and controlled environment.

F. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.

G. All controllers shall be provided with minimum 25% additional capacity for future use. Fully loaded controllers without additional capacity will not be accepted.

H. I/O Interface: Hardwired inputs and outputs may tie into system through controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.
2. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
3. Binary Outputs: Provide on-off low-voltage signal, selectable for normally open or normally closed operation.
4. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).
5. Universal I/Os: Provide software selectable binary or analog outputs.

2.8 ADVANCED APPLICATION CONTROLLERS

A. Provide this type of controller for controlling:

1. Packaged HVAC Units with integral BACnet controllers.
2. Miscellaneous small point count applications that require custom sequences

B. BACnet Compliance: Control units shall use ASHRAE 135 protocol.

C. Self-contained unit, comprising of processor board with programmable, nonvolatile, random access memory; integral interface equipment; and backup power source.

D. All controllers shall be provided with minimum 25% additional capacity for future use. Fully loaded controllers without additional capacity will not be accepted.

E. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.

F. Stand-alone mode control functions operate regardless of network status. Functions include the following:

1. Global communications.
2. Discrete/digital and analog I/O.
3. Monitoring, controlling, or addressing data points.
4. Software applications, scheduling, and alarm processing.
5. Testing and developing control algorithms without disrupting field hardware and controlled environment.

G. I/O Interface: Hardwired inputs and outputs may tie into system through controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.
2. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
3. Binary Outputs: Provide on-off low-voltage signal, selectable for normally open or normally closed operation with three-position (on-off-auto) override switches and status lights.
4. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).
5. Universal I/Os: Provide software selectable binary or analog outputs.

2.9 APPLICATION SPECIFIC CONTROLLERS

A. Provide this type of controller for controlling:

1. VAV boxes
2. Fans
3. Remote point pickup

B. Controller:

1. BACnet Compliance: Control units shall use ASHRAE 135 protocol.
2. Each Building Controller shall be able to communicate with application specific controllers (ASCs) over the subnetwork to control terminal equipment only.
3. Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network.
4. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.
5. Each ASC shall include all point inputs and outputs necessary to perform the specified control sequences. The ASC shall accept input and provide output signals that comply with industry standards. Controllers utilizing proprietary control output signals shall not be acceptable. Outputs utilized either for two-state, or proportional control, allowing for additional system flexibility.
6. All controllers shall be provided with minimum 25% additional capacity for future use. Fully loaded controllers without additional capacity will not be accepted.

7. Communication. Each controller shall perform its primary control function independent of the network and other controllers. Controllers that depend on communication to master controllers or revert to a fail-safe mode of operation during subnetwork interruption are not acceptable.

C. Control Algorithms. The controller shall receive its real-time data from the Building Controller time clock to ensure Secondary Network continuity. Each controller shall include algorithms incorporating proportional, integral and derivative (PID) gains for all applications. All PID gains and biases shall be field-adjustable at the operator workstation.

D. Control Applications. Operating programs shall be field-selectable for specific applications. In addition, specific applications may be modified to meet the user's exact control strategy requirements, allowing for additional system flexibility. Controllers that require factory changes of all applications are not acceptable.

E. Programmability. Application Specific Controllers shall be programmable, using software provided by the BMS manufacturer. Software shall be field-installable on any standard laptop or Portable Operator's Terminal. Program language shall be text-based and allow up to 200 lines of code for programming. Programming shall allow for changing sequence of operation, commanding and releasing points, additional monitoring, and command priority management within the Application Specific Controller.

F. Memory.

1. Provide each ASC with sufficient memory to accommodate point databases, operating programs, local alarming and local trending. All databases and programs shall be stored in non-volatile EEPROM, EPROM and PROM, or minimum of 72-hour battery backup shall be provided. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration.

G. Upon replacement, new ASCs shall recover control function and site-specific defaults automatically and resume normal operation.

2.10 CONTROLLER ENCLOSURE CABINETS

A. Provide enclosure cabinets with brackets suitable for either wall or floor mounting for each air handling system, boiler plant, or chiller plant, and for each miscellaneous control system. All building level system controllers, advanced application controllers, and application specific controllers that are not unit-mounted (i.e. VAV boxes, etc.) shall be located within an enclosure cabinet and mounted in a mechanical room, janitor closet, data closet, or other unoccupied service-related room.

B. Locate enclosure cabinet adjacent to the system served.

C. Fabricate enclosures of 14 gauge furniture-grade steel or 6063-T5 extruded aluminum alloy, totally enclosed on all four sides, with hinged door and keyed lock, with manufacturer's standard shop-painted finish and color.

D. Enclosure cabinets shall be U.L. listed for use with line voltage devices.

E. All indications and adjustments contained within the enclosure cabinet shall be clearly labeled as to their respective use by a bake-lite label permanently affixed to the panel.

2.11 ELECTRONIC SENSORS

A. Room Temperature Sensors

1. Flush Plate Temperature Sensors – Wired: Where called for in the sequences or on the drawings, provide sensors with stainless steel plate face flush mounted in the wall.
2. Plain Space Temperature Sensors – Wired: Where called for in the sequences or on the drawings, provide sensors with plain covers.
3. Digital Display Space Temperature Sensors – Wired: Where called for in the sequences or on the drawings, provide sensors with digital displays, setpoint adjustment, and manual override button.
4. Wireless Space Temperature Sensors: Where called for in the sequences or on the drawings, provide wireless sensors with plain or digital display covers as indicated. Digital display type shall include setpoint adjustment and manual override button.
5. The sensing element for the space temperature sensors shall be thermistor type providing the following.

a.	Element Accuracy:	+ /- 1.0°F
b.	Operating Range:	55 to 95°F
c.	Set Point Adjustment Range:	55 to 95°F
d.	Calibration Adjustments:	None required
e.	Auxiliary Communications Port:	As required

6. The digital display shall provide the following.

a. Display of temperature setpoint with numerical temperature values.
b. Display of room temperature with numerical temperature values.
c. Display of active occupied/unoccupied status.
d. Occupied/unoccupied override.

7. Wireless space temperature sensors shall be 10K Ohm Thermistor or equivalent type providing the following.

a.	Accuracy:	+ .5°F
b.	Operating Range:	55 to 95°F
c.	Monitoring Range:	55 to 95°F
d.	Battery life:	Minimum 3 years
e.	Auxiliary Communications Port:	as required

8. All sensors shall be mountable to and fully covering a standard 2x4 electrical junction box without the need for an adapter wall plate.
9. Provide the following options as they are called for in the sequences or on the drawings:

10. Setpoint adjustment. The setpoint adjustment function shall allow for modification of the temperature by the building operators. Setpoint adjustment may be locked out, overridden, or limited as to time or temperature range through software by an authorized operator at any central workstation.
11. Occupied/unoccupied override. An override button shall initiate override of the night setback mode to normal (day) operation when activated by the occupant and enabled by building operators. The override shall be limited to two (2) hours (adjustable.) The override function may be locked out, overridden, or limited through software by an authorized operator at any central workstation.

B. Space Humidity Sensors

1. Space humidity sensors shall have the same appearance as the space temperature sensors. Humidity elements shall measure relative humidity with a +/- 2% accuracy over the range of 10 to 90% relative humidity. Humidity element shall be an IC (integrated circuit) sensing element. Humidity sensing elements shall be removable and field replaceable if needed.

C. Thermistor Temperature Sensors and Transmitters:

1. Enclosure shall be a color contrasting NEMA Type 4X/IP65 including a NEMA 4X/IP65 cable gland and a 1/2 NPT conduit adapter fitting a tool-free access.
2. Accuracy: Plus or minus 0.3 deg. F at 77 deg. F calibration point.
3. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
4. Averaging Elements in Ducts: 10 feet long, flexible, true averaging, one continuous RTD element across entire length; use where prone to temperature stratification or where ducts are larger than 10 sq. ft.
5. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches.
6. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.

D. Pressure Transmitters/Transducers:

1. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
2. Enclosure shall be a color contrasting NEMA Type 4X/IP65 including a NEMA 4X/IP65 cable gland and a 1/2 NPT conduit adapter fitting a tool-free access.

    a. Accuracy: Plus or minus 0.04 inches wg full scale.
    b. Output: 4 to 20 mA and VDC multi-range.
    c. Building Static-Pressure Range: 0 to 0.25-inch wg.
    d. Duct Static-Pressure Range: 0 to 5-inch wg.

3. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150 psig operating pressure; linear output 4 to 20 mA.

4. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig operating pressure and tested to 300-psig; linear output 4 to 20 mA.
5. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
6. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.

E. Room sensor accessories include the following:

1. Insulating Bases: For sensors located on exterior walls.

F. CO_2 Sensors

1. Enclosure shall be a color contrasting NEMA Type 4X/IP65 including a NEMA 4X/IP65 cable gland and a 1/2 NPT conduit adapter fitting a tool-free access.
2. Provide indoor air quality sensors to monitor Carbon Dioxide (CO2) and/or Volatile Organic Compound (VOC) levels.
3. The CO2 sensor shall be of microprocessor-based non-dispersive infrared type.
4. The CO_2 sensors shall have dual channel calibration and accuracy of plus/minus 3 percent of the reading, plus/minus 50 ppm so that no calibration will be required.
5. The units shall be wall or duct mounted type as indicated on plans and in the sequence of operation.
6. Wall mounted sensors shall be provided with white plastic cover, without LED indicators.
7. Duct mounted sensors shall be provided without the need for a separate aspirator box.
8. The VOC sensor shall have automatic self-calibrating capability to ensure accuracy.
9. The sensor shall meet the following requirements:

a.	Operating voltage:	24 Vac +/- 20%
b.	Frequency:	50/60 Hz
c.	Power consumption:	max. 6 VA
d.	CO_2 measuring range:	0 – 2000 ppm
e.	Tolerance:	+/- 50 ppm
f.	Output:	0 – 10 Vac
g.	Calibration:	dual channel calibration
h.	VOC measurement range:	0 – 10V VOC

2.12 STATUS SENSORS

A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch w.g.

B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig, piped across pump.

C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

D. Voltage Transmitter (100 to 600V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.

E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 0-10V dc, feedback signal.

H. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

2.13 FREEZE PROTECTION THERMOSTATS

A. Snap-acting, single-pole, single-throw, automatic reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point. Switch shall automatically reset three (3) times before sending an alarm signal to the BAS.

1. Bulb Length: Minimum 20 feet.
2. Accuracy: Plus or minus 0.9 deg. F.
3. Quantity: One thermostat for every 20 sq. ft. of coil surface.
4. Location: Downstream/discharge side of the heating coil.

2.14 DAMPERS

A. Automatic dampers shall be furnished by the BAS Contractor but shall be set in place by the Mechanical Contractor. Dampers shall be of the balanced type with a maximum blade width of 8" and length of 48". Damper frames shall be galvanized sheet metal or aluminum with nylon or sintered bronze oil impregnated bearings.

B. Dampers for proportioning control shall have opposed blade action. Dampers for two position, open-closed control shall have parallel blade action.

C. Damper blades shall be airfoil blade type and have interlocking edges with compressible seals on both blade edges and ends. Dampers, when closed, shall be guaranteed by the manufacturer to meet Class 1A leakage requirements, 3 CFM/sq. ft. at 1" water gauge static pressure. Ruskin CD60, Greenheck VCD-33, or approved equal.

2.15 ACTUATORS

A. Electronic Actuators: Spring-return, direct-coupled type.

1. Valves: Size for torque required for valve close off at maximum pump dynamic differential pressure.
2. Dampers: Size for running torque calculated as follows:

a. Parallel-Blade Damper: 7 inch-lb./sq. ft. of damper.
b. Opposed-Blade Damper: 5 inch-lb./sq. ft. of damper.
c. Dampers with 2 to 3-inch w.g. of Pressure Drop or Face Velocities of 1000 to 2500 fpm: Increase running torque by 1.5.
d. Dampers with 3 to 4-inch w.g. of Pressure Drop or Face Velocities of 2500 to 3000 fpm: Increase running torque by 2.0.

3. Coupling: V-bolt and U-shaped, toothed cradle.
4. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
5. Fail-Safe Operation: Mechanical, spring-return mechanism to drive controlled device to an end position on loss of power. Electronic fail-safe shall incorporate an active balancing circuit to maintain equal charging rates among the super capacitors. The power fail position shall be proportionally adjustable between 0-100 percent in 10 degree increments with a 2 second operation delay.

a. Heating valves shall be fail open.
b. Cooling valves shall be fail closed.
c. Heating valves on terminal units (VAV's, cabinet heaters, unit heaters, etc.) may be fail to last position.
d. Outside air and exhaust air dampers shall be fail closed.
e. Return air dampers shall be fail open.

6. Power Requirements (Two-Position Spring Return): 24V ac.
7. Power Requirements (Modulating): 120V ac or 24V ac.
8. Proportional Signal: 0-10V dc or 4-20 mA, and 0-10V dc position feedback signal.
9. Temperature Rating: Minus 22 to plus 122 deg. F.
10. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg. F.
11. Actuators installed outside of the building shall be enclosed within weatherproof enclosures sealed watertight.

PART 3 - EXECUTION

3.1 GENERAL

A. All necessary equipment, labor and materials not specifically indicated or specified, but necessary to complete work, are to be provided as part of the contract.

B. Install all control equipment, accessories, wiring, and piping in a neat and workmanlike manner. All control devices must be installed in accessible locations.

C. All sensors and control devices that are to be installed within a classified/rated area shall be provided with the appropriate rating for the space in which they are located.

D. Provide all electrical relays and wiring, line and low voltage, for control systems, devices and components. Install all wiring in accordance with electrical sections (Division 26) of this specification and the National Electrical code.

E. Control panels serving equipment fed by emergency power shall also be served by emergency power.

3.2 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Connect and configure equipment and software to achieve sequence of operation specified.

C. Verify location of thermostats, humidistats, and other exposed control sensors with the drawings and room details, as well as the Owner and any wall-mounted equipment, prior to installation. Install all devices per ADA requirements.

D. The use of dual-purpose combination type sensors (i.e. temperature and humidity) is not allowed.

E. Field locate all control panels and verify locations with the Owner prior to installation. Coordinate requirements with the Electrical Contractor.

F. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. All sensor and output wiring shall be shielded cable or per manufacturers specifications which must be furnished upon request.

B. The field wiring connections of all field-mounted sensors shall be adequately protected by a junction box mounted at the point of measurement.

C. In addition to requirements of electrical sections (Division 26), all exposed low voltage wiring (less than 120 V) provided by this Contractor shall be enclosed in conduit. All 120 volt wiring shall be enclosed in EMT conduit. No flexible conduit shall be allowed for 120 volt wiring.

D. Low voltage wiring exposed along a wall within a finished space shall be enclosed with metal wiremold. See Division 26 specifications for requirements.

E. Separate conduit systems shall be provided for low voltage and line voltage wiring.

F. All wiring and conduit shall be secured at regular intervals and run parallel with the lines of the building.

G. The installation of conduit of any type, low or line voltage, through any type of ductwork is strictly prohibited.

3.4 DUCT SMOKE DETECTORS

A. The BAS Contractor shall verify the quantities of detectors required for each air handling system. Systems with a capacity of 15,000 cfm or higher or serving two (2) or more floor levels shall include duct smoke detectors in both the supply and return air mains. Verify all requirements with all applicable codes and NFPA.

3.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
2. Test and adjust controls and safeties.
3. Test calibration of controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Test each point through its full operating range to verify that safety and operating control set points are as required.
5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
6. Test each system for compliance with sequence of operation.
7. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.
5. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
6. Check temperature instruments and material and length of sensing elements.
7. Check control valves. Verify that they are in correct direction.
8. Check DDC system as follows:

a. Verify that DDC controller power supply is from emergency power supply, if applicable.
b. Verify that wires at control panels are tagged with their service designation and approved tagging system.

c. Verify that spare I/O capacity has been provided.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.6 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
4. Control System Inputs and Outputs:

   a. Check analog inputs at 0, 50, and 100 percent of span.
   b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
   c. Check digital inputs using jumper wire.
   d. Check digital outputs using ohmmeter to test for contact making or breaking.
   e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.

5. Flow:

   a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
   b. Manually operate flow switches to verify that they make or break contact.

6. Pressure:

   a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
   b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.

7. Temperature:

   a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
   b. Calibrate temperature switches to make or break contacts.

8. Stroke and adjust dampers without positioners, following the manufacturer's recommended procedure, so that damper is 100 percent open and closed.
9. Stroke and adjust control dampers with positioners, following manufacturer's recommended procedure, so that damper is 0, 50, and 100 percent closed.
10. Utilize proper diagnostic and test instruments for calibration and adjustment of system.

11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to demonstrate and train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls as specified below.

1. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
2. Schedule training with owner with at least 3 days' notice.
3. Provide operator training on data display, alarm and status descriptors, requesting data, execution of commands, and request of logs. Include a minimum of 12 hours dedicated instructor time on-site.
4. Provide screen capture software with audio capture for Owner use.
5. Additional instruction time as deemed necessary by the Owner shall be obtained from the BAS Contractor on a negotiated basis with the Owner.

END SECTION 23 09 00

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SECTION 23 09 93 - CONTROL SEQUENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of the contract, including General and Supplementary Conditions and Division 01 specification sections apply to work of this Section.

1.2 RELATED WORK

A. 23 09 00 Temperature Controls

1.3 GENERAL ITEMS

A. The BAS and Mechanical Contractors shall reference Section 23 09 00 for the requirements of all control programs and controls related hardware and devices.

B. All systems shall reference a global outdoor air temperature sensor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 VARIABLE AIR VOLUME BOXES

A. Control programs

1. Occupancy Stand-by.
2. Scheduled occupied/unoccupied.
3. Dead band.
4. Night set-back.
5. Night set-up.

B. Control devices for each unit.

1. Application Specific Controller.
2. Modulating damper actuator for VAV damper in the unit.
3. Room temperature sensor – Plain cover type.
4. Discharge air temperature sensor.
5. Electric heating coil SCR control.
6. Occupancy schedule matching RTU.

C. Control Sequence

1. The DDC control program shall modulate the VAV box actuator and electric heating coil in sequence as required to maintain room temperature setpoint.

2. On a drop in room temperature below setpoint, the air flow shall modulate from maximum to minimum air flow. On a further drop in room temperature, the electric heating coil shall modulate as required to maintain room temperature setpoint but shall not exceed the scheduled leaving air temperature. On a further call for heat, the air flow shall modulate from minimum to maximum air flow, maintaining the scheduled leaving air temperature, as required to maintain room temperature setpoint. On a rise in room temperature above setpoint, the reverse shall occur.
3. Whenever the respective system is in cooling mode or economizer, the VAV box shall not be allowed to increase air flow above 30% of maximum when reheating to control space temperature or prevent overcooling.
4. Coordinate minimum and maximum air flow settings with the air balancing contractor.
5. Whenever the discharge air temperature drops below 40 degrees F, the electric heating coil shall fully activate, and the BAS shall shut down the respective air handling system.
6. Occupancy Stand-by Cycle:

    a. Minimum ventilation settings shall be disabled and the VAV box shall be allowed to modulate to the fully closed position.
    b. Note: Room temperature setpoint shall not be set back or set up in the occupancy stand-by cycle.
    c. The occupancy stand-by control shall not be implemented on VAV boxes that serve multiple rooms with multiple occupancy sensors.

7. Direct expansion cooling systems:

    a. Coordinate system minimum airflow requirements with the equipment manufacturer to determine total VAV box minimum airflow settings required to prevent coil frosting and/or low limit discharge air shutdown.

3.2 VARIABLE AIR VOLUME AIR HANDLING UNITS

A. Equipment served

1. RTU-1, RTU-2, and RTU-3

B. Control programs

1. Morning warm up.
2. Optimal start.
3. Scheduled occupied/unoccupied.
4. Supply air reset.
5. Static pressure reset.
6. Enthalpy economizer.
7. Night set-back.
8. Night set-up.

C. Control Devices

1. Building Level System Controller.
2. Combination outside air damper and airflow measuring station and modulating damper actuator.
3. Return air damper and modulating damper actuator.
4. Outputs for fan motor speed control.
5. Discharge air, return air and mixed air temperature sensors.
6. Return air humidity sensor.
7. CO_2 sensor (return air)
8. Duct mounted static pressure sensors (quantity as indicated).
9. High limit static pressure sensor.
10. Smoke detector (furnished by E.C.).
11. Filter air pressure drop differential sensor.
12. Fan status feedback.
13. Freeze protection thermostat.

D. Occupied Cycle

1. The unit fan motors shall start and the outside air and return air dampers shall slowly open to provide the minimum outside air airflow whenever the unit is scheduled to the occupied cycle.
2. The DDC control program shall, in sequence, modulate the DX cooling coil, economizer dampers, and gas-fired heating coil to maintain discharge air temperature setpoint as calculated by the supply air reset program.
3. The DDC control program shall modulate the unit fan speed to maintain duct static pressure setpoint as calculated by the static pressure reset program. Duct mounted static pressure sensors shall be located where indicated on the plans in the supply ductwork.
4. As the DDC control program modulates the fan speed, the outside air and return air dampers shall also modulate to maintain a constant minimum flow of outside air as indicated on the plans.

E. Dehumidification Cycle

1. Whenever the return air humidity exceeds high limit setpoint the DDC control program shall override the supply air reset program and control to a constant 55 deg. F supply air temperature. VAV box electric heating coil shall modulate as required to maintain room temperature setpoints.
2. When the return air humidity falls below high limit setpoint the DDC control program shall revert back to the normal supply air reset control.

F. Unoccupied Cycle

1. The fan motor shall cycle intermittently, at night set-back/set-up temperatures, with the outside air damper closed whenever any one of the room sensors calls for heating or cooling. VAV boxes shall be controlled by their respective DDC control program. When all zones have been satisfied the unit shall stop.

G. General

1. The outside air damper shall close whenever the unit fan motor is off.
2. The DDC control program shall modulate the heating coil valve as required to maintain low limit mixed air temperature (65 deg. F.) whenever the unit fan motor is off.
3. The auto reset freeze protection thermostat shall stop the unit fan motor, close the outside air damper, and open the heating coil valve whenever the coil discharge temperature drops below 35 deg. F.
4. The outside air damper shall modulate toward the increased minimum position and the return air damper shall modulate toward the closed position whenever the CO_2 concentration differential between the indoor sensor and the outside air exceeds setpoint (75 ppm). When the CO_2 level differential is reduced to 50 ppm, the outside air damper shall return to its reduced minimum position.
5. The smoke detector shall be located in the return air duct and shall stop the unit fan motor whenever smoke is present.
6. The high limit static pressure sensor shall be located in the supply ductwork near the fan discharge. Upon a rise in static pressure above setpoint (5" W.C.) the DDC control program shall override the "occupied-unoccupied" schedule and stop the unit fan motors.

3.3 ROOF EXHAUST FANS – SCHEDULED OCCUPIED/UNOCCUPIED

A. Fans served

1. EF-1

B. Control programs

1. Scheduled occupied/unoccupied.

C. Control devices for each unit.

1. Application Specific Controller.
2. Outputs for fan motor control.
3. Fan status.
4. Exhaust air damper and two position damper actuator.

D. Control Sequence

1. The DDC control program shall open the exhaust air damper and start the unit fan motor whenever the system is scheduled to the occupied cycle.

3.4 ROOF EXHAUST FANS – TEMPERATURE CONTROL

A. Fans served

1. EF-4

B. Control devices for each unit

1. Application Specific Controller.
2. Outputs for fan motor control.
3. Fan status.
4. Exhaust air damper and two position damper actuator.
5. Room temperature sensor – Plain type.
6. Reverse acting room thermostat.

C. Control Sequence

1. The exhaust air damper shall open and the unit fan motor shall start whenever the room temperature rises above setpoint.

3.5 ROOF EXHAUST FANS – MANUAL CONTROL WITH UNOCCUPIED OFF

A. Fans served

1. EF-2, EF-3

B. Control programs

1. Scheduled occupied/unoccupied.

C. Control devices for each unit.

1. Application Specific Controller.
2. Outputs for fan motor control.
3. Fan status.
4. Exhaust air damper and two position damper actuator.
5. Remote 0-60 minute digital timer with pilot light.

D. Control Sequence

1. The DDC control program shall open the exhaust air damper, start the unit fan motor and light the pilot light whenever the digital timer is activated and the system is scheduled to the occupied cycle.
2. Upon completion of the timer, the fan shall stop, the exhaust air damper shall close and the pilot light shall be off.
3. The fan shall stop, the exhaust air damper shall close and the pilot light shall be off whenever the system is scheduled to the unoccupied cycle.
4. Install digital timer where indicated on the drawings or as directed by the Owner. Label switch with service.

3.6 DESTRATIFICATION FANS

A. Fans served

1. DSF-1, thru DSF-4

B. Control devices for each unit.

1. Application Specific Controller.
2. Upper level space temperature sensor.
3. Outputs for fan motor speed control
4. Room temperature sensor – Plain cover type.
5. Remote 0-60 minute digital timer with pilot light.

C. Control programs

1. Scheduled occupied/unoccupied.

D. Occupied Cycle

1. The DDC control program shall monitor the temperature near the ceiling as well as the room temperature in the occupied zone.
2. On a call for heat in the space the DDC control program shall compare the temperature near the ceiling with the room temperature. If the temperature near the ceiling is higher than the room temperature, the DDC control program shall start the destratification fans as the first stage of heat and modulate the fan speed as required.
3. After a time delay of 10 minutes (adj.), if there is still a call for heating the central air handling unit gas fired heating coil, or VAV box electric heating coil, shall modulate open (see respective control sequences). The destratification fans shall continue to run until there is call for cooling from the system.
4. In cooling mode, if the temperature near the ceiling is at least 10 degrees higher than the room temperature, the DDC control program shall start the destratification fans and modulate the fan speed as required until the upper and lower temperatures are within 2 degrees of each other.

E. Unoccupied Cycle

1. The destratification fans shall be off when the system enters the unoccupied cycle.
2. On a call for heat in the space the DDC control program shall compare the temperature near the ceiling with the room temperature. If the temperature near the ceiling is higher than the room temperature, the DDC control program shall start the destratification fans as the first stage of heat and modulate the fan speed as required.
3. After a time delay of 30 minutes (adj.), if there is still a call for heating the central air handling unit shall enter the unoccupied heating cycle (see AHU control sequences). When the unoccupied room temperature setpoint has been satisfied the destratification fans shall stop.
4. In cooling mode, if the temperature near the ceiling is at least 10 degrees higher than the room temperature, the DDC control program shall start the destratification fans and modulate the fan speed as required until the upper and lower temperatures are within 2 degrees of each other.

F. Manual Override

1. The DDC control program shall start the unit fan motor at a predetermined speed and light the pilot light whenever the digital timer is activated.
2. Upon completion of the timer, the fan shall stop, and the pilot light shall be off.

END OF SECTION 23 09 93

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SECTION 23 11 26 - NATURAL GAS PIPING

PART 1 - GENERAL

1.1 SCOPE

A. All work in this section is subject to the provisions of the General HVAC Requirements, and all other parts of the Contract Documents applicable to this Section of Work.

1.2 WORK INCLUDED

A. Natural Gas Piping

1.3 RELATED WORK

A. Section 23 05 29 - Supports and Anchors

1.4 REFERENCES

A. ANSI/ASME - Boiler and Pressure Vessel Code

B. ANSI/ASME Sec 9 - Welding and Brazing Qualifications

C. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV

D. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV

E. ANSI B31.1 - Code for power piping (over 125 psig)

F. ANSI/ASME B31.9 - Building Services Piping

G. ANSI/AWS A5.8 - Brazing Filler Metal

H. ANSI Z49.1 - Safety in Welding and Cutting

I. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless

J. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses

K. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

L. ASTM B32 - Solder Metal

M. ASTM B88 - Seamless Copper Water Tube

N. AWS D1.1 - Structural Welding Code

O. ASTM D 2513-00 - 'Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings

1.5 QUALITY ASSURANCE

1.6 SUBMITTALS

A. Submit product data under provisions of Section 23 05 00.

B. Include data on pipe materials, pipe fittings, and accessories.

PART 2 - PRODUCTS

2.1 NATURAL GAS

A. 2" and smaller: ASTM A53, type E or S, standard weight (schedule 40) black steel pipe with ASTM A197/ANSI B16.3, Class 150, black malleable iron threaded fittings or ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

B. 2 ½" and larger: ASTM A53, type E or S, standard weight (schedule 40) black steel pipe with ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

C. Below-Ground Gas Piping And Fittings: All sizes shall be ASTM A53. standard weight (schedule 40) X-TRU-COAT plastic coated steel pipe. All fittings shall be welded.

D. Below-Ground Gas Piping And Fittings: Polyethylene pipe and fittings meeting requirements of ASTM D 2513 with No. 14 coated copper trace wire.

2.2 UNIONS AND FLANGES

A. 2" and smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black iron on black steel piping. Use unions of a pressure class equal or higher than that specified for the fittings of the respective piping service but not less than 250 psi.

B. 2 ½" and larger: ASTM 181 or A105, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern and of a pressure class compatible with that specified for valves, piping specialties and fittings of the respective piping service. Flanges smaller than 2 ½" may be used as needed for connecting to equipment and piping specialties. Use raised face flanges ANSI B16.5 for mating with other raised face flanges on equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for mating with other flat face flanges on equipment. Gasket material to be non-asbestos and suitable for pressures and temperatures of the piping system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

D. After completion, fill, clean, and treat systems.

3.2 INSTALLATION

A. General:

1. Install all piping plumb and parallel to building walls and ceilings and at heights which do not obstruct any portion of windows, doorways, stairways, or passage ways. Where interferences develop in the field, offset or reroute piping as required to clear such interferences
2. Group piping whenever practical at common elevations.
3. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
4. Provide clearance for installation of insulation, and access to valves and fittings.
5. Do not route piping through transformer vaults, or above transformers, panel boards, or switchboards including the required service space for this equipment, unless the piping is serving this equipment.
6. Do not route piping through elevator equipment rooms unless piping is serving equipment in this room.
7. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
8. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain bottom of pipe level.
9. Install unions downstream of valves and at equipment or apparatus connections.
10. Welding is required on all black piping 2 ½” and larger.
11. Copper piping may be used for heating water service in lieu of Schedule 40 Black on piping 2” and smaller. Install brass ball valve at junction of dissimilar piping.

B. Welded Pipe Joints:

1. Make all welded joints by fusion welding in accordance with ASME Codes, ANSI B31, and State Codes where applicable.

C. Threaded Pipe Joints:

1. Use a thread lubricant or Teflon tape on threaded pipe joints; no hard setting pipe thread cements or caulking is allowed.

D. Copper Pipe Joints:

1. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean all fittings and tube with emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joints. Use 95-5 solder or brazing to secure joint as specified for the specific piping service.

E. Natural Gas Piping:

1. Entire gas piping installation shall be in accordance with the latest requirements of the AGA, NFPA 54 – National Fuel Gas Code, State, and Local Codes.
2. Permissible Assemblies for Welding Piping Systems:

    a. The following specification covers permissible assemblies for welded pipe lines for all services operating at 160 psig or less.

        1) Mitered tees will not be permitted in welded lines. Connections shall be made with welding tees. The use of lines provided they are installed in prefabricated assemblies and the pipe interior is cleaned of slag. Field installation of weldolets will be permitted in lines 5” and larger if the installation is cleaned inside after welding.
        2) The use of mitered elbows in welded lines will not be permitted. Welding elbows shall be used for bends.
        3) Mitered reducers will not be permitted in welded lines.
        4) The pipe ends in tees, laterals, and reducers shall be carefully prepared to provide for proper weld penetration.
        5) Steel and iron piping, 2-1/2” in size and larger, shall have joints welded, except joints obviously intended to be connected by means of bolted flanges. End to end joints of the same size pipe sizes 3/4”through 1” may be butt welded provided that an internal welding ring is used.

3. Do not install gas piping below a building or its foundation.
4. Gas piping shall be installed with plugged drip pockets at low points.
5. Valves, gas cocks, and unions shall be installed on inlet pipe to equipment including safety valves where required or noted to be installed.
6. Connect gas piping to gas meter provided by local gas company.
7. All gas piping in inaccessible areas and piping 2 ½” and larger shall have welded joints. Provide pre-weld type fittings. Paint welded areas with primer.
8. Pitch horizontal piping down 1 inch in 60 feet in the direction of flow. Install full size dirt leg at the bottom of each vertical run and at each appliance. When installing mains and branches, cap gas tight each tee or pipe end which will not be immediately extended. All branch connections to the main shall be from the top of the main.
9. Prime coat and apply rust resistant finish enamel coat to all gas piping exposed to weather. Paint gas piping to blend in with adjacent wall or roof color. Color is subject to approval by architect.
10. Install all underground-pipe in accordance with manufacturer's recommendations and local gas utility company regulations and specifications.

a. Polyethylene pipe installers shall be properly trained and certified in procedure for joining polyethylene pipe.
b. Provide 24 inch minimum steel pipe between vertical rise of riser and end of polyethylene line if anode-less riser is not used. Use plastic-to-steel transition or compression fitting between end of polyethylene line and steel meter riser. Provide cathodic protection for steel riser or use anode-less riser.
c. Place tracer wire alongside of polyethylene pipe from meter to point where pipe rises inside building.
d. Place 4 inches of sand around gas line buried underground.

F. Leak Testing:

1. Verify that the piping system being tested is fully connected to all components and that all equipment is properly installed, wired and ready for operation. If required for additional pressure load under test, provide temporary restraints at expansion joints or isolate them during test.
2. Natural gas piping shall be air tested at 100 psig for 24 hours with no drop in pressure or as dictated by local codes or ordinances if greater.

END OF SECTION 23 11 26

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SECTION 23 31 00 - DUCTWORK

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Metal ductwork

B. Flexible ductwork

C. Duct cleaning

D. Duct leak testing

1.2 RELATED WORK

A. Section 23 05 29 - Supports and Anchors

B. Section 23 05 93 - Testing, Adjusting and Balancing

C. Section 23 07 00 - HVAC Insulation

D. Section 23 33 00 - Ductwork Accessories

E. Section 23 36 00 - Air Terminal Units

F. Section 23 37 00 - Air Outlets and Inlets

1.3 REFERENCES

A. ASHRAE - HVAC Systems and Equipment Handbook; Chapter 16 – Duct Construction

B. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles

C. ASTM A167 - Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

D. ASTM A 366 - Steel, Sheet, Carbon, Cold Rolled, and Commercial Quality

E. ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

F. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality

G. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate

H. NBS PS15-69 - Standard for Construction and Testing for Products Intended for use in Aggressive Chemical Environments

I. NFPA 90A - Installation of Air Conditioning and Ventilating Systems

J. NFPA 96 - Ventilation Control and Fire Protection of Commercial Cooking Operations

K. SMACNA - HVAC Air Duct Leakage Test Manual

L. SMACNA - HVAC Duct Construction Standards – Metal and Flexible

M. SMACNA - Thermoplastic Duct (PVC) Construction Manual

N. UL 181 - Factory Made Air ducts and Connectors

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Shop Drawings and Product Data:

1. Indicate types of flexible ductwork to be used. Include data sheets and installation instructions.
2. Provide manufacturer's data sheets for factory-fabricated ductwork and fittings. Include information on materials of construction, wall thickness, fitting construction, pressure class, joint construction, sealing, and assembly and installation instructions.
3. Provide manufacturer's data sheets for proprietary duct connection system components. Include information on flange construction, duct wall gauge requirements, fastening hardware, gasketing, fittings, and assembly and installation instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Galvanized Steel Ductwork: ASTM A525 and ASTM A527 galvanized steel sheet, lock-forming quality, having G90 zinc coating of 1.25 oz./sf. Total for two (2) sides in conformance with ASTM A90.

B. Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum connectors and Bar Stock; Alloy 6061-T6 or of equivalent strength.

C. Flexible Ductwork:

1. Return or Exhaust Applications:

a. UL 181, Class 1 air duct material constructed of impregnated/coated woven fiberglass cover permanently bonded to a coated spring wire helix or flat steel bands.
b. Pressure Rating: 16" WG positive and 2.0" WG negative

c. Maximum Velocity: 5000 fpm
d. Temperature Range: 0° F to 200° F continuous
e. Manufacturer: Thermaflex S-TL or approved equal

2. Low Pressure Supply Air Applications (Downstream of VAV Units):

a. UL 181, Class 1 air duct material constructed of a vinyl or polymeric inner duct permanently bonded to a coated spring wire helix or flat steel bands.
b. Insulation: 1" thick, 1 lb. Density, flexible glass fiber insulation, enclosed by a seamless, fiberglass reinforced, aluminized vapor barrier jacket. Insulation K value of 0.23 or less at 75° F
c. Pressure Rating: 10" WG positive and 1.0" WG negative
d. Maximum Velocity: 3000 fpm
e. Temperature Range: 0° F to 200° F continuous
f. Manufacturer: Thermaflex M-KE or approved equal

D. Fasteners: Rivets, bolts, or sheet metal screws.

E. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone, with tape, or with heavy mastic.

F. Ductwork Support Materials:

1. Hot-dipped galvanized fasteners, anchors, hanger rods, straps, trim and angles shall be used to support ductwork.
2. Hanger Rod: ASTM A36; threaded both ends, threaded one end, or continuously threaded.
3. Support stainless steel ductwork with matching stainless steel support materials.
4. Support aluminum ductwork with aluminum support materials or with materials electrolytically isolated from the ductwork.

2.2 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated. Exposed galvanized metal ductwork shall be constructed of paintable sheet metal.

B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

D. Fabricate continuously welded round and oval duct fittings two (2) gauges heavier than duct gauges indicated in SMACNA Standard. Joints shall be minimum 4" cemented slip joint, continuous welded, or spot-welded and sealed. Prime coat welded joints.

E. Provide standard 45-degree lateral wye or 90 degree conical tee fittings at branch connections to round duct mains. Provide 45-degree entry or conical fittings at branch connections to rectangular duct mains.

2.3 MANUFACTURED DUCTWORK AND FITTINGS

A. Ductwork and fittings shall be factory fabricated in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing as required for operating pressures indicated. Contractor fabricated ductwork meeting the specified construction standards shall be acceptable with prior approval of the Architect/Engineer. Submit construction details, materials used, type or service, reinforcing methods, and sealing procedures for prior approval.

B. Manufacturers: Foremost Duct, Inc., Semco, and United-McGill.

C. Round/Flat Oval Ductwork: Machine made from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two (2) gauges heavier metal than duct. Longitudinal welded seam duct shall be used where diameters exceed 84" or for metal gauges where spiral duct is unavailable.

D. Double-Wall Insulated Ductwork: Outer shell gauge shall be based on the actual outer shell dimensions. Duct diameter indicated on drawings is the liner dimension. Inner liner shall be constructed of solid [or perforated] sheet metal gauge based on manufacturer's recommendations for size of duct indicated. Space between inner liner and outer duct to be filled with 1" thick glass fiber insulation.

E. Ductwork shall be constructed of paintable galvanized sheet metal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install and seal ductwork in accordance with SMACNA HVAC Duct Construction standards – Metal and Flexible.

B. Fibrous glass ductwork may "not" be substituted for internally or externally insulated or uninsulated low pressure sheet metal ductwork.

C. Do not install duct sealant when temperature is less than those recommended by sealant manufacturers. Maintain temperatures during and after installation of duct sealant.

D. Verify dimensions at the site, making field measurements and drawings necessary for fabrication and erection. Check plans showing work of other trades and consult with Architect/Engineer to resolve interferences.

E. Seal ductwork joints, seams and duct wall penetrations, of systems located external to conditioned spaces, in accordance with SMACNA seal class recommended for pressure class indicated.

F. All ductwork serving general exhaust systems shall be sealed with Sure-Bond No. 188 Clear Silicone.

G. Construct and install ductwork to NFPA 90A standards.

H. Duct sizes indicated on the drawings are inside clear dimensions.

I. No variation of duct configuration or sizes permitted except by prior approval of Architect/Engineer. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

J. Provide frames constructed of angles or channels for coils, filters, dampers or other devices to be installed in the duct systems. Make all connections to such equipment, including equipment furnished by others. Install sheet metal close-off fabrications to prevent air bypass around channel mounted equipment. Fasten close-off sheets to interior plenum or casing wall and equipment support channels.

K. Set plenum or casing doors 6” to 12” above floor. Arrange door swing so that fan static pressure holds door in closed position.

L. Provide supplementary auxiliary steel members required to support ductwork. Attach to building structure. Attach steel members by or clamping.

M. Install all motor operated dampers and connect to or install all duct-mounted equipment furnished by other trades.

N. Branch ductwork shall be provided for all air outlets and inlets and shall be constructed with sufficient length to contain the grille plus any damper, in fully open position, without obstructing main duct air flow.

O. Round or oval ductwork exposed in occupied finished areas shall be free from dents and scratches, and duct sealant applied shall have a smooth, finished appearance.

P. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

Q. Where ductwork penetrates interior partitions, floors, and exterior walls, pack the annular space with insulation and conceal the space between opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Where ducts pass through fire-rated floors, walls or partitions, provide fire stopping between duct and opening.

R. Ductwork connecting to louvers shall pitch toward the louver and drain outside the building. Solder or seal duct seams near the louvers to form watertight joints.

S. Blank off all unused portions of louvers with 1-1/2" rigid insulation. Provide galvanized sheet metal backing on both sides of insulation. Paint sheet metal backing visible through the louver matte black.

T. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

U. Do not install ductwork through dedicated electrical or elevator equipment rooms or spaces unless the ductwork is serving the room or space.

V. Pitch exhaust ductwork serving high moisture areas or moisture generating equipment to drain back to the exhaust grille or equipment served.

W. Use double nuts and lock washers on threaded rod supports.

X. Connect diffusers to ductwork with 5' maximum length of flexible duct.

Y. Connect flexible ducts to metal ducts with stainless steel draw bands and per ductwork manufacturers written instructions.

Z. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.2 CLEANING

A. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

3.3 LEAK TESTING

A. Test All ductwork indicated in accordance with test methods defined in the SMACNA HVAC Air Duct Leakage Test Manual. Do not insulate ductwork until it has been successfully tested. Test pressure shall be equal to the duct pressure class. Repair and reseal leaking ductwork or fittings and retest.

B. Test the following duct systems (maximum allowable leakage rate):

1. Supply air upstream of VAV units (1% of system air quantity).

C. Submit a signed report to the Owner's representative indicating test apparatus used, leakage test results, and remedial work done to bringduct systems into compliance with specified leakage rates.

3.4 DUCTWORK APPLICATION SCHEDULE

AIR SYSTEM	MATERIAL	PRESSURE CLASS
Supply Downstream of VAV Units	Galvanized Steel, Aluminum	2.0"
Supply Upstream of VAV Units	Galvanized Steel	4.0"
Return and Relief	Galvanized Steel, Aluminum	4.0"
General Exhaust	Galvanized Steel, Aluminum	2.0"
Outside Air Intake	Galvanized Steel	2.0"
Combustion Air	Galvanized Steel, Aluminum	2.0"

END OF SECTION 23 31 00

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SECTION 23 33 00 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Volume control dampers

B. Backdraft dampers

C. Automatic control dampers

D. Air turning devices

E. Flexible duct connections

F. Duct access doors

G. Duct test holes

H. Acoustic flexible duct

I. Access panels

1.2 RELATED WORK

A. Section 23 05 93 - Testing, Adjusting and Balancing

B. Section 23 09 00 – Temperature Controls

C. Section 23 31 00 - Ductwork

D. Section 23 37 00 - Air Outlets and Inlets

1.3 REFERENCES

A. AMCA 503-93 - Fire, Ceiling and Smoke Dampers Application Manual

B. NFPA 90A - Installation of Air Conditioning and Ventilating Systems

C. NFPA 92A - Smoke Control Systems

D. SMACNA - HVAC Duct Construction Standards – Metal and Flexible

E. UL 33 - Heat Responsive Links for Fire-Protection Service

F. UL 181 - Factory Made Air Ducts and Air Connectors

G. UL214 - Tests for Flame Propagation of Fabrics and Films

H. UL 555 - Fire Dampers and Ruskin Ceiling Dampers

I. UL 555C - Ceiling Radiation Dampers

J. UL 555S - Smoke Dampers

1.4 SUBMITTALS

A. Submit under provisions of Section 23 05 00:

1. Product Data and Shop Drawings: Indicate pertinent dimensions, general construction, component connections and details, anchorage methods, hardware location, and installation details.
2. Installation Instructions: Provide manufacturer's installation instructions. Provide UL listed installation instructions for all fire dampers and smoke dampers.

PART 2 - PRODUCTS

2.1 VOLUME CONTROL DAMPERS FOR ACCESSIBLE CEILING

A. Acceptable Manufacturers: Greenheck, Ruskin, Cesco, and Air Balance

B. Provide manual balancing dampers in accordance with SMACNA Duct Construction Standards except where the following requirements are more stringent.

C. Provide single bladed dampers for damper sizes less than 36" wide by 12" high. Frames for single bladed dampers shall be galvanized steel minimum 20 gauge.

D. Provide opposed blade dampers with maximum blade size of 48" wide by 6" high. Frames for multi-blade dampers shall meet or exceed SMACNA thickness requirements and shall have blade linkage concealed in the jamb.

E. Damper blades shall meet or exceed SMACNA thickness requirements and shall be reinforced with three (3) structural vee's.

F. Except in round balancing dampers, 12" diameter and under, provide oil impregnated end bearings.

G. Provide vinyl end bearings in all round dampers 12" diameter and under.

H. Provide manual locking, indicating hand quadrant. On dampers wider than 30", provide a hand quadrant at each end. On insulated ducts mount hand quadrant on a formed standoff bracket.

2.2 VOLUME CONTROL DAMPERS FOR UN-ACCESSIBLE CEILING

A. Acceptable Manufacturer: Young Regulator.

B. Provide manual balancing dampers in accordance with SMACNA Duct Construction Standards except where the following requirements are more stringent.

C. Provide round duct dampers constructed of heavy duty galvanized steel spiral frame.

D. Damper blades shall be "V" style 20 gauge galvanized steel blade secured with ½" diameter steel shaft and Teflon bushings that require no lubrication.

E. Include all necessary hardware to ensure compatibility with Bowden remote cable control system.

F. Provide damper controller and cable to allow damper operation from occupied space. Cable to consist of Bowden cable .054" stainless steel control wire encapsulated in 1/16" flexible galvanized spiral sheath.

G. Control kit shall include 2-5/8" diameter die cast aluminum housing with 3" diameter zinc plated cover, 14 gauge steel rack and pinion gear drive. Cover is to be painted to match ceiling.

2.3 BACKDRAFT DAMPERS.

A. Acceptable manufacturer: Greenheck, Cesco, and Ruskin

B. Provide gravity counterbalanced backdraft dampers; size as indicated on the drawings.

C. Damper blades shall be 6063T5 extruded aluminum, .050" wall thickness, with extruded vinyl blade seals. Blade linkages shall be aluminum. Blade end bearings shall be nylon.

D. Damper frame shall be 6063T5 extruded aluminum.

2.4 AUTOMATIC CONTROL DAMPERS

A. Acceptable Manufacturers: Greenheck, Air Balance, Cesco, and Ruskin.

B. Provide opposed blade control damper of the 100% shut-off type. Maximum leakage at a differential pressure of 4" w.g. across the damper shall be 10 CFM per square foot of damper area.

C. Damper blades shall be minimum 16 gauge galvanized steel with three (3) longitudinal vee type grooves for reinforcement. Blade linkages shall be concealed in the frame of the damper.

D. Blade edge seals shall be silicone rubber and have a flame spread rating less than 25 and a smoke developed rating less than 50. Seals shall provide a tighter seal against leakage as pressure across the damper increases.

E. Damper frame shall be 16 gauge galvanized steel formed into a hat channel with reinforced corners. A low profile head and sill must be incorporated on all dampers less than 17" high. Jamb seals shall be stainless steel compression type.

F. Damper actuator will be by the Temperature Control Contractor in accordance with Section 23 09 00.

2.5 AIR TURNING DEVICES

A. Acceptable Manufacturers: Aero Dyne, Anemostat, and Hart & Cooley

B. Shop fabricated turning vanes are not acceptable.

C. Use only steel or aluminum airfoil type vanes and construct in accordance with SMACNA Fig. 2-3 and Fig. 2-4.

D. Construct vanes for short radius elbows and elbows where one dimension changes in the turn in accordance with SMACNA Fig. 2-5 and Fig. 2-6.

2.6 FLEXIBLE DUCT CONNECTIONS

A. Acceptable Manufacturers: Ventfabrics or an approved equal.

B. Provide connections that are fire retardant, UL214 listed, and meet all requirements of NFPA 90A.

C. Connection shall be constructed of a glass fiber fabric with a 3" minimum width. This fabric shall be manufacturer supplied connected airtight to two 3" minimum width metal edging strips.

D. Flexible connections installed in interior non-corrosive applications shall be double coated with Neoprene (polychloroprene) and shall be suitable for temperatures ranging from –10° F to 200° F. Fabric shall have a nominal weight of 30 oz. per square yard.

E. Flexible connections installed in exterior non-corrosive applications shall be double coated with DuPont Hypalon (chlorosulfurated polyethylene) and shall be suitable for temperatures ranging from –10° F to 275° F. Fabric shall have a nominal weight of 26 oz. per square yard.

F. Flexible connections installed in interior or interior or exterior corrosive environments shall be coated with DuPont Teflon and shall be suitable for temperatures ranging from –20° F to 500° F. Fabric shall have a nominal weight of 14 oz. per square yard. Do not use flexible connections on kitchen exhaust systems.

2.7 DUCT ACCESS DOORS

A. Provide access doors constructed in accordance with SMACNA HVAC Duct Construction Standards Figs. 2-12 and 2-13 except where the following is more restrictive.

B. Construction of doors shall be suitable for the pressure class of the duct in which they are to be installed. Materials of construction to be identical to adjacent ductwork. All access doors shall be sealed with a material that has a flame spread rating less than 25 and a smoke developed rating less than 50.

C. Provide minimum 1" thick insulated doors when installed in insulated ductwork. Insulation shall be completely covered with door metal.

D. Access doors smaller than 12" square may be secured with cam sash locks. Access doors larger than 12" square must be provided with continuous piano hinge and two (2) cam sash locks for sizes up to 24" x 36". Provide additional dual acting handles for larger sizes.

E. Shop fabricated access doors and doors constructed with sheet metal screw fasteners are not acceptable.

2.8 DUCT TEST HOLES

A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.9 ACOUSTIC FLEXIBLE DUCT

A. Acceptable Manufacturers: Clevaflex Type DB and Thermaflex Type MK-E.

B. Provide factory fabricated UL 181 Class I flexible duct with a flame spread rating of 25 or less and a smoke developed rating of 5o or less.

C. Provide ductwork with a minimum 1" fiberglass insulation blanket with a minimum density of ¾ lb. per cubic foot and a vapor barrier jacket of polyethylene or metalized reinforced film laminate. Maximum vapor transmission rating or vapor barrier jacked to be 0.1 perm.

D. Ductwork shall be capable of maintaining a round shape without sagging or drooping.

2.10 ACCESS PANELS

A. Acceptable Manufacturers: Milcor and Cesco

B. Provide 24" x 24" access panels where indicated with extruded aluminum frame, .060" thick, suitable for the adjacent wall or ceiling construction.

C. Access door shall be galvanized bonderized steel panel. Panel shall be locked with a key lock closure to prevent tampering.

D. Provide fire rated panels, listed by UL, in all masonry shafts or walls requiring fire rated enclosures.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions.

B. All dampers shall be installed square and free from racking. Check to insure unrestricted range of motion with no binding.

C. Provide balancing dampers in low pressure supply, return, and exhaust ductwork at points where branches are taken from larger ducts as required for air balancing. Provide splitter dampers only where indicated.

D. Provide balancing dampers on medium and high pressure systems where indicated.

E. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated. Adjust counter balance weights to provide proper operation.

F. Provide ductwork flexible connections immediately adjacent to fans and motorized equipment in ductwork. Connect to sheet metal ductwork as directed by the manufacturer. Seal connections to SMACNA Leakage Class C.

G. Provide ductwork access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, fire dampers, and elsewhere as indicated. Provide largest square access panel possible in ductwork, but provide a minimum 8” x 8” size for hand access, 18” x 18” size for shoulder access, and other sizes as indicated.

H. Provide duct test holes where indicated on the drawings and where required for testing and balancing purposes.

I. Install acoustic flexible ductwork downstream of VAV boxes. Install maximum 5’ length without kinking or flattening. A maximum of one (1) 90 degree elbow is acceptable.

J. Provide access panels to proper Contractors for their accurate installation prior to the start of construction.

K. Seal all openings made in the ductwork to accommodate the installation of any accessory to SMACNA Leakage Class C. Verify that the sealants used have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with UL 214.

END OF SECTION 23 33 00

SECTION 23 34 15 - UPBLAST ROOF EXHAUST FANS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Roof exhausters

1.2 RELATED WORK

A. Section 23 05 13 - Motors and Starters

B. Section 23 09 00 - Building Automation System

C. Section 23 31 00 - Ductwork

D. Section 23 33 00 - Duct Accessories: Automatic control dampers, backdraft dampers

1.3 REFERENCES

A. AMCA 99 - Standards Handbook

B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes

C. AMCA 300 - Test Code for Sound Rating Air Moving Devices

D. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices

E. SMACNA - Low Pressure Duct Construction Standard

1.4 QUALITY ASSURANCE

A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 23 05 00.

B. Provide product data on roof exhausters.

C. Provide fan curves with specified operating point clearly plotted.

D. Submit sound power levels for both fan inlet and outlet at rated capacity.

E. Submit manufacturer's installation instructions under provisions of Section 23 05 00.

PART 2 - PRODUCTS

2.1 UPBLAST ROOF EXHAUST FANS.

A. Furnish and install centrifugal roof exhaust fans of size and capacity as indicated on Plans. Units shall be belt drive or direct drive as scheduled.

B. Fans shall be AMCA rated and include the following:

1. Non-fused disconnect switch under hood, factory mounted
2. Gasketed gravity or automatic aluminum dampers (as per schedule) in a frame for mounting in curb
3. Housing - heavy gauge spun aluminum
4. Birdscreen - 3/4" galvanized metal or vinyl coated steel
5. Motor and drives shall be isolated from the exhaust system
6. Integral rubber isolators
7. Regreasable 200,000 hour life bearings suitable for cold weather operation down to -20° F
8. All motors 1/3 hp, 120/60/1 and smaller to be furnished with start capacitors and built in overload protection.
9. All polyphase 2-speed motors shall be 2-winding type.
10. Quiet operating fan with sound levels as indicated, based on tests conforming to ASHRAE Standard 36-62
11. All magnetic or manual starters by Electrical Contractor
12. Insulated pre-fab curb minimum 14" high. Greenheck Model GPR Welded or equivalent

C. Acceptable Manufacturers:

1. Cook
2. Greenheck
3. Acme
4. Carnes

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure roof exhausters with lag screws to roof curb.

END OF SECTION 23 34 15

SECTION 23 36 00 - AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Variable volume terminal units

B. Variable volume regulators

C. Integral damper motor operators

D. Integral controls

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 23 09 00 - Building Automation System: Thermostats and control components

1.3 RELATED WORK

A. Applicable provisions of Division 01 govern work of this section.

B. Section 23 09 00 – Temperature Controls

C. Section 23 31 00 - Ductwork

D. Section 23 33 00 - Ductwork Accessories

E. Section 23 37 00 - Air Outlets and Inlets

1.4 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilation Systems

B. UL 181 - Factory-Made Air Ducts and Connectors

C. ADC 1062 - Air Distribution and Control Device Test Code

1.5 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00.

B. Submit shop drawings indicating configuration, general assembly, and materials used in fabrication.

C. Submit product data under provisions of Section 23 05 00.

D. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings, which indicate air flow, static pressure, and NC designation.

E. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of 1” to 4” wg (250 to 1000 Pa).

F. Submit manufacturer's installation instructions under provisions of Section 23 05 00.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Section 23 05 00.

B. Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.

C. Include directions for resetting constant volume regulators.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Titus

B. Price

C. Carnes

D. Environmental Technologies

E. Metal Aire

2.2 MANUFACTURED UNITS

A. Furnish and install pressure independent variable air volume boxes of size and capacity as shown on the plans. Units shall be provided with the following: dual minimum air flow settings, one for cooling and one for heating (see VAV box schedule for dual minimum CFM capacities), with external electric damper operator, electric reheat coil, where indicated.

1. Note: Coordinate requirements with Temperature Control Contractor.

B. The air pressure drop through the unit shall not exceed the values tabulated on the plans.

C. Unit casing shall be minimum 22 gauge steel with internally lined with non-porous, ½" thick sealed liner of 1.5 lb./cu. ft. density insulation and neoprene or vinyl coating on the exposed insulation surfaces. All discharge edges of the unit liner must be secured with metal brackets equivalent to Titus Micro-Loc. Construction to meet UL 181 and NFPA 90A. Casing shall be sealed to limit leakage to a maximum of 15 cfm at 6.0' of static pressure. Casing outlet shall have slip and drive joint for connection to a discharge ductwork. Provide units with insulated access panel with fasteners and hanger brackets.

D. Metal damper blade shall be mounted to shaft having self-lubricated bearings. Shaft end shall be marked to indicate damper position and shall have a built-in stop to prevent overstroking. Damper blade shall close off against gasket to limit leakage to 10 cfm at 6.0" of differential static pressure. Damper linkage and actuator shall be furnished meeting requirements of the sequence of operation specified in Section 23 09 93.

E. Round inlet collar shall be equipped with a cross-shaped or ring type, multi-point flow sensor that shall amplify the measured velocity pressure. Pneumatic tubing from flow sensor to reset volume controller shall be UL listed, fire retardant (FR) type. The sensor must provide a minimum differential pressure signal of 0.03" W.G. at an inlet velocity of 555 FPM.

F. The terminals shall be equipped with pressure independent direct digital controls furnished and installed by the Control Contractor. Control Contractor shall provide data sheets on all components to be mounted, indicating wiring and piping diagrams for each application identified by unit tag per the schedule in the drawings.

G. Controls shall be compatible with pneumatic inlet velocity sensors supplied by the terminal manufacturer.

H. Controls shall be field set by Control Contractor for the scheduled minimum and maximum flow rates. Flow measuring taps and flow curves will be supplied with each terminal for field balancing airflow. Each terminal shall be equipped with labeling showing unit location, size, and scheduled cfm.

I. Actuator shall be direct connection shaft mount type without linkage.

2.3 ACCESSORIES

A. Proportional electric coils shall be supplied and installed on the terminal by the terminal manufacturer. Coils shall be ETL listed. Coils shall be housed in an attenuator section integral with the terminal with element grid recessed from unit discharge a minimum of 5 inches to prevent damage to elements during shipping and installation. Elements shall be 80/20 nickel chrome, supported by ceramic isolators a maximum of 3½ inches apart, staggered for maximum thermal transfer and element life, and balanced to ensure equal output per step. The integral control panel shall be housed in a NEMA 1 enclosure with hinged access door for access to all controls and safety devices.

B. Heaters shall be equipped with a proportional SCR controller to modulate the heater load according to the temperature control signal. The electronic controller shall be compatible with the following input signals.

1. Variable voltage signal 0-10 VDC
2. Pulse width modulation AC or DC

C. Heaters shall be equipped with a controller to control heater coil firing. The control panel shall include an interface to control heater coil firing in proportion to the ATC signal. The ATC signal shall connect to low voltage universal signal interface circuitry supplied and installed by the terminal manufacturer. The universal interface shall allow at least the following seven interface options without additional interface circuitry.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide ceiling access doors or locate units above easily removable ceiling components.

C. Support units individually from structure. Do not support from adjacent ductwork.

D. Connect to ductwork in accordance with Section 23 31 00.

END OF SECTION 23 36 00

SECTION 23 37 00 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SCOPE

A. All work in this section is subject to the provisions of the General HVAC Requirements, and all other parts of the Contract Documents applicable to this Section of Work.

1.2 WORK INCLUDED

A. Grilles and Diffusers

1.3 REFERENCES

A. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems

B. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets

C. SMACNA - Low Pressure Duct Construction Standard

1.4 SUBMITTALS

A. Submit product data under provisions of Section 23 05 00.

B. Provide product data for items required for this project.

C. Submit schedule of outlets and inlets indicating type, size, location, application, and noise level.

D. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data and schedules of outlets and inlets.

PART 2 - PRODUCTS

2.1 GRILLES AND DIFFUSERS

A. Acceptable Manufacturers:

1. Titus
2. Price
3. MetalAire
4. Tuttle and Bailey

B. Louvered Face Ceiling Diffusers:

1. Square or rectangular louvered face ceiling diffusers shall consist of an outer frame assembly with an integral square or rectangular inlet. A transition piece shall facilitate attachment of a round duct.
2. An inner core assembly consisting of fixed deflection louvers shall be available in 1, 2, 3, or 4-way horizontal discharge patterns. Diffuser shall be constructed of 22 gauge steel or aluminum. Refer to schedule on drawings for material construction type.
3. Unless specified otherwise, finishes shall be #26 white. Finish shall be an anodic acrylic paint, baked at 315° F. The finish must pass a 250 hour ASTM-870 water immersion test. The finish must also pas the ASTM D-2794 Reverse Impact Cracking Test with a 50 inch pound force applied.
4. Provide T-bar mounting panel for lay-in mounting requirements. Provide surface mount border for applicable surface mounting requirements when required.
5. In special space restricted circumstances and only with Engineers approval, a heavy gauge damper, mounted in the diffuser core may be used. Damper must be operable from the face of the diffuser.
6. The manufacturer shall submit published performance data for the diffuser at the conditions specified and scheduled. The manufacturer shall submit published NC values at the conditions specified and scheduled. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

C. Fixed Deflection Plenum Slot Diffusers:

1. Fixed deflection Plenum Slot Diffusers shall be of the sizes and mounting type as shown on the drawings and schedule.
2. The discharge deflectors shall be fixed in 1-way or 2-way blow directions.
3. Units shall be constructed of 24 gauge steel and shall have a plenum height of 9”. The plenum shall be factory insulated with external insulation.
4. Unless specified otherwise, finishes shall be #26 white. Finish shall be an anodic acrylic paint, baked at 315° F. The finish must pass a 250 hour ASTM-870 water immersion test. The finish must also pas the ASTM D-2794 Reverse Impact Cracking Test with a 50 inch pound force applied.
5. The plenum shall be drawn from the plenum wall to eliminate leakage. Provide a minimum of 1” inlet for duct connections.
6. Provide cross notch for T-bar installation when required. Provide additional mounting t-bars and filler clips to allow installation on non-standard ceiling grids when required.
7. Provide factory furnished plaster frames when required.
8. The manufacturer shall submit published performance data for the diffuser at the conditions specified and scheduled. The manufacturer shall submit published NC values at the conditions specified and scheduled. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

D. Adjustable Slot Diffusers:

1. Adjustable Modulinear Plenum Slot Diffusers shall be of the size and mounting type shown on the drawings and schedule.
2. Diffusers shall be of length, number of slots and widths as indicated on drawings.

3. Units shall be constructed of 24 gauge steel and shall have a plenum height of 11". The plenum shall be factory insulated with external insulation.
4. Unless specified otherwise, finishes shall be #26 white. Finish shall be an anodic acrylic paint, baked at 315° F. The finish must pass a 250 hour ASTM-870 water immersion test. The finish must also pas the ASTM D-2794 Reverse Impact Cracking Test with a 50 inch pound force applied.
5. The plenum shall be drawn from the plenum wall to eliminate leakage. Provide a minimum of 1 1/8" inlet for duct connections.
6. Factory mounted T-bars shall be provided for ceiling compatibility as required.
7. Each slot shall be provided with a two-element pattern controller capable of not only 180° air pattern, but also air volume control for final balancing. All adjustments shall be accessible from the face of the diffuser. The pattern controllers shall have a center divider with two independently adjustable pattern controller in each slot. Installing contractor shall consult with Engineer for configuration of pattern controllers to provide desired air flow pattern.
8. The manufacturer shall submit published performance data for the diffuser at the conditions specified and scheduled. The manufacturer shall submit published NC values at the conditions specified and scheduled. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

E. Sidewall Mounted Supply Grilles:

1. Sidewall mounted supply grilles shall be size and mounting type shown on the drawings and schedule.
2. Grilles shall have double-deflection blades and shall be parallel to the short dimension of the grille.
3. Construction shall be of aluminum with a 1 ¼" wide border on all sides. Screw holes shall be countersunk for neat appearance.
4. Deflection blades shall be contoured to a specifically designed and tested cross-section to meet published performance data. Blades shall be spaced on ¾" centers. Blades shall be of same material as the grille. Blades shall have friction pivots on both sides to allow individual blade adjustment without loosening or rattling. Plastic blade pivots are not acceptable.
5. When specified on the drawings, the opposed blade volume damper shall be constructed of heavy gauge material that is the same material as the grille construction. The damper must be operable from the face of the grille.
6. Unless specified otherwise, finishes shall be #26 white. Finish shall be an anodic acrylic paint, baked at 315° F. The finish must pass a 250 hour ASTM-870 water immersion test. The finish must also pas the ASTM D-2794 Reverse Impact Cracking Test with a 50 inch pound force applied.
7. The manufacturer shall submit published performance data for the diffuser at the conditions specified and scheduled. The manufacturer shall submit published NC values at the conditions specified and scheduled. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

F. Sidewall Return Or Exhaust Grilles:

1. Sidewall return or exhaust grilles shall be size and mounting type shown on drawings and schedule.
2. Grilles shall have fixed deflection blades and shall be parallel to the long dimension of the grille.
3. Construction shall be of aluminum with a 1 ¼" wide border on all sides. Screw holes shall be countersunk for neat appearance.
4. Deflection blades shall be contoured to a specifically designed and tested cross-section to meet published performance data. Blades shall be of same material as the grille. Blades shall be firmly held in place by mullions from behind the grille and fixed to the grille by welding in place. Blade deflection shall be 38°.
5. When specified on the drawings, the opposed blade volume damper shall be constructed of heavy gauge material that is the same material as the grille construction. The damper must be operable from the face of the grille.
6. Unless specified otherwise, finishes shall be #26 white. Finish shall be an anodic acrylic paint, baked at 315° F. The finish must pass a 250 hour ASTM-870 water immersion test. The finish must also pas the ASTM D-2794 Reverse Impact Cracking Test with a 50 inch pound force applied.
7. The manufacturer shall submit published performance data for the diffuser at the conditions specified and scheduled. The manufacturer shall submit published NC values at the conditions specified and scheduled. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install items in accordance with manufacturers' instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with airtight connection.

D. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION 23 37 00

SECTION 23 51 00 - VENTING, BREECHING, CHIMNEYS AND STACKS

PART 1 - GENERAL

1.1 SCOPE

A. All work in this section is subject to the provisions of the General HVAC Requirements, and all other parts of the Contract Documents applicable to this Section of Work.

1.2 WORK INCLUDED

A. Double Wall Type “B” Gas Vents

B. Double Wall Positive Pressure Vents and Breeching

1.3 RELATED WORK

A. Section 23 05 48 – Vibration Isolation

1.4 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 23 05 00.

1. Include materials of construction, dimensions, weight, support and layout of breechings. Where factory built units are used, submit layout drawings indicating plan view and elevations. Identify all methods of support and building structural members utilized for such support.

PART 2 - PRODUCTS

2.1 DOUBLE WALL TYPE “B” GAS VENTS

A. All vent piping, fittings and accessories shall be UL listed type “B” and shall be in compliance with NFPA 54 and NFPA 211.

B. Fabricate inner pipe of sheet aluminum or stainless steel, and outer pipe of galvanized sheet steel, tested in compliance with UL 441. Minimum thickness of inner and outer pipes to be as follows:

Pipe Size	Inner Pipe Thickness	Outer Pipe Thickness
6” round and smaller	0.012”	28 gauge
7” to 18” round	0.014”	28 gauge
20” to 24” round	0.018”	26 gauge

C. Provide all necessary piping accessories, including flashing, counter flashing, storm collars, insulated thimble, clean outs, fittings and necessary supports.

D. Provide rain cap with bird screen that is compatible with both the venting system and the appliance being vented.

E. Manufacturers: Ampco, Selkirk Metalbestos or Metal-Fab

2.2 DOUBLE WALL POSITIVE PRESSURE VENTS AND BREECHING

A. All stacks, breeching and accessory fittings to be double wall type with a 1" space between walls. Venting system shall be U.L. listed for continuous operation at 1400° F and 1800° F intermittent operation.

B. Inner pipe shall be type 304 stainless steel of 0.036" minimum wall thickness for sizes through 36" ID and 0.048" minimum wall thickness for sizes over 36" ID. All inner pipe seams shall be full penetration welded the entire length of the pipe section.

C. Construct outer jacket of aluminized steel with a thickness of 0.034" for sizes through 36" ID and 0.052" for 38" to 48" ID. Construct outer jacket of Type 304 stainless steel where exposed to atmospheric conditions with a thickness of 0.03" for sizes through 36" ID and 0.48" for 38" to 48" ID. All outer jacket seams shall be full penetration welded the entire length of the pipe section.

D. Between the inner pipe and outer jacket there shall be a minimum of a 1" air gap. Stainless steel centering clips shall be welded to the outer shell to maintain 1" spacing and to ensure concentricity of the pipe and jacket.

E. All connections to be sealed with pressure tight draw bands and high temperature sealant. Sealant shall be suitable for flue gas temperatures up to 600°.

F. Include all necessary expansion joints, tees, elbows, rain caps, flashing, counter flashing, cable guys where required, cleanout, drain, exit cone, roof thimble, and any other component required for a complete installation.

G. Include all support plates and guides to support weight of the venting system and to provide a fixed point to allow proper operation of expansion joints.

H. Manufacturers: Shebler, Ampco, Selkirk Metalbestos, or Metal-Fab

2.3 BREECHINGS

A. Construct all breechings of 14 gauge ASTM A527 galvanized steel with ANSI/AST A525 G90 zinc coating. All longitudinal seams to be welded. End to end joints may be made with welded connection or companion flanges. Coat all external welded joints and seams with galvanized paint.

B. Provide adjustable self-actuating barometric draft dampers on all units that utilize an atmospheric burner. Barometric draft dampers shall be equal to size of breeching.

C. Provide cleanout doors same gauge as breeching.

D. Fabricate breeching fittings to match adjoining breechings. Fabricate elbows with the centerline radius equal to 1.5 times breeching diameter. Limit angular tapers to 20° maximum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Double Wall Type “B” Vents and Double Wall Positive Pressure Double Wall Vents

1. Installation and clearances to combustibles shall comply with all State and Local Codes, and shall be in accordance with the manufacturer’s recommendations.
2. Support from building structure with suitable ties, braces, hangers and anchors to hold shape and prevent buckling. Minimum support for vertical section shall be at all floor penetrations. Support from floor structure, roof structure, or adjacent structural surfaces.
3. Install with a minimum amount of joints and align connection accurately to maintain smooth internal surfaces.
4. Install all stacks plumb and pitch upward from fuel-fired equipment to stack.
5. Clean all venting during installation, removing dust and debris.
6. Provide slip joints at all appliances to allow removal of appliances without dismantling of venting system.
7. Seal all joints in accordance with manufacturer’s recommendations, using only sealants recommended by the manufacturer.
8. Vents located on roof shall extend a minimum of 3’-0” above the highest point of the roof within a 10’-0” radius.

END OF SECTION 23 51 00

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SECTION 23 81 03 - ROOFTOP HEATING AND COOLING UNITS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Installation of packaged rooftop heating and cooling unit

B. Installation of packaged factory controls

1.2 RELATED WORK

A. Section 23 05 13 - Motors

B. Section 23 07 00 - Ductwork Insulation

C. Section 23 09 00 - Temperature Controls

D. Section 23 31 00 - Ductwork

1.3 QUALITY ASSURANCE

A. Conform to requirements of UL and Applicable Codes.

B. Unit shall be designed to conform to ASHRAE 15.

C. Unit shall be UL and UL, Canada, tested and certified in accordance with ANSI Z21.47 Standards as a total package.

D. Unit casing shall be capable of withstanding 500-hour salt spray exposure per ASTM B117 (scribed specimen).

E. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

F. Roof curb shall be designed to conform to NRCA Standards.

G. Unit shall be rated in accordance with ARI Standards 210 (03-12) and 360 on all others. All units shall be designed in accordance with UL Standard 1995. Unit shall be rated in accordance with ARI sound standards 270 or 370.and rate cooling system to API Standard 210.

H. Unit shall well exceed ASHRAE 90.1-2001 Energy Efficiency Standards. All units shall be ENERGY STAR qualified. On 03 to 06 sizes - SEER shall be as high as 14.8. On 06 to 16 sizes - EER shall be as high as 12.5 and on sizes 20 to 28 - EER shall be as high as 11.6.

I. Unit shall be manufactured in a facility registered to ISO 9001:2000.

J. Each unit shall be subjected to a completely automated run testing on the assembly line.

1.4 SUBMITTALS

A. Submit shop drawings under provisions of Section 23 05 00.

B. Submit with shop drawings, schematic layouts showing condenser, refrigeration compressors, heating coils, cooling coils, blowers and accessories required for complete system.

C. Submit manufacturer's installation instructions under provisions of Section 23 05 00.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Aaon

B. Trane

C. York

D. Carrier

E. McQuay

2.2 SYSTEM DESCRIPTION

A. Install units complete as follows:

1. Factory Unit is an outdoor rooftop mounted, electrically controlled heating and cooling unit utilizing fully hermetic scroll compressors with on demand crankcase heaters for cooling duty and induced draft gas combustion for heating duty. Supply air shall be discharged downward or horizontally, as shown on contract drawings. Units shall be of ultra high cooling efficiency and utilize environmentally friendly R-410A refrigerant.
2. The unit shall be a fully factory assembled, pre-tested, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, refrigerant charge R-410A, and special features required prior to field start-up.
3. The Unit shall be approved by UL or ARI.

4. Unit Cabinet: Constructed of galvanized steel, bonderized and coated with a pre-painted baked enamel finish on all externally exposed surfaces. Internal surfaces shall be of a primer coated finish. All air stream interior surfaces shall be insulated with a minimum 1/2-in. thick, 1 lb density foil-faced cleanable insulation. Insulation shall be bonded with a thermosetting resin (8 to 12% by weight nominal, phenol formaldehyde typical), and coated with an acrylic or other material that meets the NFPA 90 flame retardance requirements and has an "R" value of 3.70. Insulation shall also be encapsulated with panel design or tape edges ensuring secure fit. Cabinet panels shall be hinged with integrated non-corrosive hinges. Large area hinged access panels for the filter, compressors, evaporator fan, and control box and heat section areas. Each panel shall use multiple quarter-turn latches and handles. Each major external hinged access panel shall be double-wall construction and permanently attached to the rooftop unit. Panels shall also include tiebacks. Return air filters shall be accessible through a dedicated hinged access panel and be on a slide-out track using standard size filters. Filter shall be standard off the shelve sizes and be the size per cabinet. Capability for 2 or 4 inch filters shall be on all sizes. Unit shall have a factory-installed internally sloped condensate drain pan, providing a minimum ¾-in.-14 NPT connection to prevent standing water from accumulating. Pan shall be fabricated of high impact polycarbonate material and shall slide out for cleaning and or maintenance on 03-16 sizes. Pan shall be fabricated of epoxy powder coated steel for other sizes. All drain pans conform to ASHRAE 62 self-draining provisions.
5. Indoor Blower (Evaporator Fan): Centrifugal supply air blower shall have rubber-isolated, cartridge type ball bearings (03-16) or pillow-block ball bearings (20-28) and adjustable belt drive. Fan wheel shall be made from steel with a corrosion resistant finish. It shall be a dynamically balanced, double-inlet type with forward-curved blades. The indoor fan system (blower wheels, motors, belts, and both bearings) shall slide out for easy access. Evaporator-fan motors shall be continuous operation, open drip-proof. Bearings shall be sealed, permanently lubricated ball-bearing type for longer life and lower maintenance.
6. Condenser Fan: Condenser fans shall be of the direct-driven propeller type, with corrosion-resistant aluminum blades riveted to corrosion-resistant steel supports. They shall be dynamically balanced and discharge air upwards. Condenser-fan motors shall be totally enclosed, thermally protected, and be of a shaft down design to protect from direct contact from harsh environments.
7. Compressors: Fully hermetic, scroll type with on demand crankcase heaters, internal high-pressure and temperature protection. Factory mounted on rubber grommets and internally spring mounted for vibration isolation. Be mounted on dedicated mounting plate to ensure secure design and reduced sound levels.
8. Coils: Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed. Dual circuit models shall have face-split type evaporator coil. Condenser and evaporator coils shall be single slab, single pass design to facilitate easy coil cleaning. Composite coils or coils that require unit top panels removed shall be unacceptable. Coils shall be leak tested at 170 psig and pressure tested at 1875 psig.

9. Heating Section: Shall be Induced-draft combustion type with energy saving direct-spark ignition system and redundant main gas valve with 2-stage capability on all 3-phase units.
10. Heat Exchanger: The optional stainless steel heat exchanger shall be of the tubular-section type, constructed of a minimum of 20-gage type 409 stainless steel, including stainless steel tubes, vestibule plate, and collector box.
11. Burners: Burners shall be of the in-shot type constructed of aluminum-coated steel. All factory-installed orifices are for operation up to 2,000 feet of altitude. For altitudes between 2,000 ft and 7,000 ft, a factory certified kit shall be furnished for field installation. The integrated gas controller (IGC) board shall include gas heat operation fault notification using an LED (light-emitting diode). Unit shall be equipped with anti-cycle protection with one short cycle on unit flame rollout switch or 4 continuous short cycles on the high-temperature limit switch. Fault indication shall be made using an LED. The IGC board shall contain algorithms that modify evaporator-fan operation to prevent future cycling on high-temperature limit switch. The LED shall be visible without removal of control box access panel.
12. Refrigeration Components: Each refrigerant circuit shall include: Balanced port thermostatic expansion valve (TXV) with removable power element, Solid core refrigerant filter driers with pressure ports and Refrigerant pressure gage ports and connections on suction, discharge, and liquid lines.
13. Filter Section: Panel filters shall be 2" thick throwaway glass fiber, 35% efficient pleated. Standard filter section shall consist of factory-installed 2-in. thick disposable fiberglass filters and shall be on a dedicated slide out track to easily facilitate access and replacement.
14. Power Exhaust Air Section: All fans shall be statically and dynamically balanced for quiet operation. All units shall be direct driven by a permanently lubricated motor with inherent overload protection.
15. Controls and Safeties: Units shall include: Scrolling Marquee display, Unit control with standard suction pressure transducers and condensing temperature thermistors, unit shall provide a 5° F temperature difference between cooling and heating set points to meet ASHRAE 90.1 Energy Standard, unit shall provide and display a current alarm list and an alarm history list, Compressor minimum run time (3 minutes) and minimum off time (5 minutes) are provided, Multiple capacity stages, Unit shall be complete with self-contained low-voltage control circuit. Unit shall have 0° F low ambient cooling operation.
16. Safeties: Unit shall incorporate a solid-state compressor lockout that provides optional reset capability at the space thermostat, should any of the following safety devices trip and shut off compressor:

    a. Compressor lockout protection provided for either internal or external overload
    b. Low-pressure protection
    c. Freeze protection (evaporator coil)
    d. High-pressure protection (high pressure switch or internal)
    e. Loss of charge protection

17. Outside Air Section: Outside air arrangement shall be 0 to 100% outside air with economizer control. 0 to 100% outside air economizer control shall consist of low leak outside, return air and exhaust air dampers, adjustable potentiometer, damper motor and an adjustable enthalpy controller mounted in the outside air stream. An enthalpy controller shall be provided to sense the dry bulb temperature and relative humidity of the outside air for use in cooling. The enthalpy controller shall prevent compressor operation when the outside air temperature and humidity can satisfy the cooling load.
18. Motors: Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have line break thermal and current overload protection. Evaporator fan motor shall have permanently lubricated, sealed bearings and inherent automatic-reset thermal overload protection or manual reset calibrated circuit breakers. Evaporator motors are designed specifically for Carrier and do not have conventional horsepower (hp) ratings listed on the motor nameplate. Motors are designed and qualified in the “air-over” location downstream of the cooling coil and carry a maximum continuous bhp rating that is the maximum application bhp rating for the motor; no “safety factors” above that rating may be applied. All evaporator fan motors 5 hp and larger shall meet the minimum efficiency requirements as established by the Energy Policy Act of 1992 (EPACT), effective October 24, 1997. Totally enclosed condenser-fan motor shall have permanently lubricated, sealed bearings, and inherent automatic-reset thermal overload protection. Induced-draft motor shall have permanently lubricated sealed bearings and inherent automatic-reset thermal overload protection.
19. Roof Curb: The prefabricated 14-gauge galvanized steel insulated roof curb shall be 24” high with weatherproof gasketing between the unit and curb.
20. Manufacturer to furnish a five (5) year compressor warranty.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Mechanical Contractor shall receive, unload, inspect unit for hidden damages, and store with proper protection.

B. The Mechanical Contractor shall install the rooftop unit and the pre-fab curb. Unit shall be installed watertight to prevent any water leaks around the units. Units shall be mounted level on curb base.

C. The Mechanical Contractor shall check, test, and start-up the heating cycle and cooling cycle of each rooftop unit.

END OF SECTION 23 81 03

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SECTION 23 82 00 - TERMINAL HEAT TRANSFER UNITS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Electric Wall Heaters

1.2 RELATED WORK

A. Section 23 05 13 - Motors

B. Section 23 09 00 - Temperature Controls

1.3 SUBMITTALS

A. Submit shop drawings, product data and samples under provisions of Section 23 05 00.

PART 2 - PRODUCTS

2.1 ELECTRIC WALL HEATERS

A. Assembly: UL listed and labeled.

B. Heating Elements: Use corrosion resistant heating elements, designed for even distribution of air across the heating element, and installed to prevent noise of expansion and contraction.

C. Provide units with necessary overheat protection, reset devices and contactors.

D. Fan powered units must be provided with integral thermostat and controls to maintain fan operation until residual heat in the heating elements has been dissipated. The fans and motors shall be balanced and mounted for vibration free operation.

E. Construct cabinets of 18 gauge steel, furnished exposed cabinets with a baked enamel finish in one of the manufacturer's standard color.

F. Acceptable Manufacturers:

1. Qmark
2. Berko
3. Markel
4. or approved substitute

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Electrical Contractor shall furnish power to the unit as indicated on the plans.

END OF SECTION 23 82 00

SECTION 26 05 00 – ELECTRICAL CONTRACT REQUIREMENTS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work under this Section.

1.2 APPLICABLE PUBLICATIONS

A. Publications, standards and listing requirements called out in the Sections of this Division of Labor shall form a part of these specifications as if contained herein.

B. The requirements of the Contract Documents, including the General Conditions, and Supplementary Conditions, and Division 01 - General Requirements, apply to this section except as modified herein.

1.3 DESCRIPTION OF WORK

A. Sections included:

1. Section 26 05 00 - ELECTRICAL CONTRACT REQUIREMENTS
2. Section 26 05 01 - PROJECT SPECIAL CONDITIONS
3. Section 26 05 02 - ELECTRICAL DEMOLITION
4. Section 26 05 04 - DOCUMENTATION
5. Section 26 05 05 - THROUGH PENETRATION FIRESTOPPING
6. Section 26 05 19 - WIRE AND CABLE
7. Section 26 05 26 - GROUNDING
8. Section 26 05 29 - SUPPORTING DEVICES
9. Section 26 05 34 - RACEWAYS
10. Section 26 05 35 - ELECTRICAL BOXES
11. Section 26 05 36 - CABLE TRAYS
12. Section 26 05 37 - LOCATION OF OUTLETS AND EQUIPMENT
13. Section 26 05 53 - ELECTRICAL IDENTIFICATION
14. Section 26 05 73 - ELECTRICAL SYSTEMS ANALYSIS
15. Section 26 09 23 - LIGHTING CONTROLS
16. Section 26 24 16 - PANELBOARDS
17. Section 26 27 02 - MOTOR WIRING
18. Section 26 27 26 - WIRING DEVICES
19. Section 26 27 28 - CIRCUIT AND MOTOR DISCONNECTS
20. Section 26 43 13 - SURGE PROTECTION DEVICES
21. Section 26 51 13 - INTERIOR LIGHTING FIXTURES
22. Section 27 10 00 - STRUCTURED CABLING SYSTEM
23. Section 27 51 18 - DANCE ACTIVITY ROOM SOUND SYSTEM
24. Section 27 51 19 - CREATIVE STUDIO SOUND SYSTEM

25. Section 27 51 20 - GAME ROOM SOUND SYSTEM
26. Section 27 51 21 - HOSPITALITY AND LOUNGE AUDIO / VIDEO SYSTEM
27. Section 27 51 24 - PAGING SYSTEM
28. Section 28 23 00 - SECURITY CAMERA SYSTEM
29. Section 28 24 00 - ACCESS CONTROL
30. Section 28 31 10 - VOICE ADDRESSABLE FIRE ALARM SYSTEM

B. Work Included:

1. The work covered by this Division of the specifications includes the furnishing of all labor, materials, tools, equipment, permits, certificates and temporary protection necessary for or incidental to executing and completing the electrical work, communications work, and work on related systems.
2. All work shall be as specified and indicated on the drawings unless specifically excepted on the drawings or herein.
3. Read all other Divisions of the Specifications which are applicable to this work, including the General Conditions section applicable to all bidders.
4. The Electrical Contract Requirements section is a supplement to and not a replacement for the project General Conditions section.
5. In cases of conflict with information in the General Conditions, the more stringent of the contract requirements shall be considered applicable.
6. Prior to submitting bid, call to the attention of the Electrical Engineer any material or apparatus believed to be inadequate or any necessary items or work omitted.
7. Address any questions regarding the interpretation of the plans and/or specifications at least 12 days before the bid opening.
8. The Electrical Engineer reserves the right to interpret his own specifications and plans after bids are received, and to demand that the installation conform to his intent.
9. Failure to become acquainted with existing conditions at the site shall in no way relieve the responsibility for making installation in conformance with plans and specifications without additional cost to the owner.

C. Examination of Plans, Specifications and Site:

1. Before submitting a bid, the bidder shall familiarize himself with all features of the building and site which may affect the execution of his work.
2. No extra payment will be allowed for the failure to obtain this information.
3. If there are omissions or errors in the plans or specifications, they shall be clarified with the architect prior to submitting bid.
4. For all remodeling projects, a site visit to the premises, for the purpose of the noting of all existing conditions which may affect work is required.
5. Knowledge of all existing conditions, which may affect work in a renovation project, shall be included in the preparation of bid.
6. Lack of information on existing conditions shall not be allowed for a valid cause for additional compensation.

D. Codes, Permits, and Inspection Fees

1. All work and materials shall conform in every respect to the current rules and requirements of the National Fire Protection Association, National and State Electrical Codes, Local Codes and Ordinances, Local Utility Regulations and OSHA.
2. Give to the proper authorities all required notices relating to the project, obtain all official permits and licenses required, pay all fees incidental thereto, deliver upon completion of the work and without cost to the Owner all required certificates of inspection and approval.

1.4 RELATED WORK ELSEWHERE

A. Applicable provisions of Division 01: General Conditions shall govern work in this section.

B. All other Divisions of the Specifications which are applicable to or interface with work in Division 26 05 00.

C. Division 26 contractor to furnish and install all boxes, conduit and 120 volt connections for Division 27 and 28 required systems.

D. Division 26 contractor to include all costs for Division 27 and 28 in their bid.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. Submit shop drawings following Section specific Shop drawing submittal guidelines.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit operation and maintenance manuals in accordance with Section 26 05 04.

B. Submit operation and maintenance manuals following Section specific shop drawing submittal guidelines.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts are to be new, undamaged and unused of current manufacture.

C. Acknowledges acquaintance with the plans and specifications and their respective requirements.

D. Guarantee that the electrical system has been installed strictly in accordance with the electrical plans and specifications using only the best of materials available, installed in a substantial manner by experienced labor.

E. Various components of the electrical system shall be placed in service prior to completion date as instructed by Owner. This shall not change the guarantee period which shall be one year after acceptance by Owner.

F. Replace and/or repair any items failing from causes of faulty workmanship, materials or design without cost to Owner at any time within one year from date of final acceptance.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

PART 2 - PRODUCTS

2.1 GENERAL

A. It is the intent of these specifications that all the necessary material, apparatus, and devices to complete the installation as specified herein, except such parts as are specifically excepted, shall be provided.

B. If an item is either shown on the plan or called for in these specifications, it shall be considered sufficient of said item in this contract.

C. All sizes given are as minimum.

D. Material and labor shall be first class and workmanlike and to the satisfaction of the Electrical Engineer and shall be subject to inspection test and approval at all times from commencement until acceptance of completed work.

E. Manufacturers shall be responsible for providing material listed by U.L. or other approved agencies, and all governing codes and ordinances.

F. All material must bear U.L. and/or other approved labels where possible.

G. Items specified by catalog number or brand name and approval of shop drawings will not relieve the manufacturer of this responsibility.

2.2 MATERIALS: ALTERNATE MATERIALS

A. Where materials, equipment apparatus, or other products are specified by manufacturer, brand name, and type of catalog number such designation is to establish standards of desired quality and style and shall be the basis of the bid.

B. Substitutions shall not be made unless there are "equals" listed in the specifications or on the plan.

C. Substitutions may be bid as alternates.

D. Burden of proof that materials are equal shall be upon bidder requesting their use; therefore, bidder shall furnish, with their request for approval all supporting data.

E. Assume responsibility for substituted material and state name of manufacturer, type or brand or equipment and addition to or deduction from base bid.

F. Materials and equipment must meet all requirements as to type, quality, function, appearance and physical dimensions shown.

G. Assume responsibility for any costs to other Divisions as a result of the use of alternate materials.

H. Submit supporting data to Architect/Electrical Engineer within 15 days after the bid date.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Equipment Submittal Drawings

1. Within 45 days after a notice to proceed and prior to ordering equipment, furnish to the Electrical Engineer submittal drawings for review (see section 26 05 04).
2. Review of any submittal drawings does not waive any condition of the specifications unless specifically noted thereon.
3. No fabrication or ordering of equipment shall be started until reviewed drawings are returned.

3.2 FIELD MEASUREMENTS

A. Job Drawings

1. Maintain, at the job site, one (1) complete set of up-to-date plans and written specifications, complete with all addenda items.
2. This complete plan and specification set shall be reserved for all field markings to show minor revisions and detailed construction notes.
3. These marked plans shall be returned to the Electrical Engineer prior to contract completion and final payment.
4. Assist the Electrical Engineer in transferring applicable field notes to the project drawings for record purposes.

3.3 DELIVERY, STORAGE AND HANDLING

A. Material on Site and Storage

1. Maintain proper care and storage of material and equipment on site.
2. Any material damaged by rust corrosion, warping, breakage, finish damage, etc. shall be replaced by the Contractor to the satisfaction of the Engineer.

3.4 INSTALLATION

A. Field Change Orders

1. No revisions to the contract price shall be allowed unless such revisions have been authorized in writing by both Owner and the change order submitter.
2. All work completed prior to completion of a written contract change order will not be compensated for by the Owner.
3. Any work item that is proposed to perform, on the basis of a proposed contract adder, must be announced in advance such that time is available for the Architect, Owner and the Electrical Engineer to determine if a change in contract price is allowable.

B. Change Orders

1. Change orders may be requested as a part of this project.
2. Assume the following in regards to change orders:

    a. Work and equipment associated with change orders shall be installed per the specified equipment on this project.
    b. All change orders shall be accounted for on as-built drawings.
    c. Change order additions to special systems where riser diagrams have been furnished, shall be included as a part of the riser diagram.
    d. A break down of all costs associated with the change order is required.
    e. The cost breakdown shall be as follows:

        1) Itemized list of all materials.
        2) Materials shall be priced at Best Column in a national pricing service book.
        3) Cost for subcontractor services.
        4) Subcontractor services shall be shown as actual costs from subcontractor.
        5) Material mark-up.
        6) Maximum allowed is 8%.
        7) Number of hours of labor at standard charge out rate.
        8) Total change order cost.

3. If equipment or materials are deducted as a part of this change order, credit shall also be shown on change order.

C. Installation: General

1. Connections to Equipment Furnished By Others.

a. Included in Division 26 are electrical connections to equipment provided by others.
b. Refer to final shop drawings for equipment provided by other divisions for exact location of electrical outlets and the connections required.
c. Provide energization to the equipment furnished by other Divisions only at the request of the providing party.
d. Assume that once the equipment has been started up, that it shall be shut off unless it is requested that it be left on by the providing party.
e. Only start up and turn on equipment if requested so by the party providing said equipment.
f. If required, power shall not be activated to the equipment until qualified starting personnel are on site.
g. After making a permanent power connection, the breaker shall be left in an off position and a "hold" tag or some other device be utilized to keep the power turned off to the equipment.
h. Visit the site prior to bid and bring any specific relocation of equipment questions to the attention of the Owner and Electrical Engineer prior to bidding.

2. Equipment Access & Location.

a. All equipment, junction and pull boxes, and accessories shall be installed to permit access to equipment for maintenance.
b. Any relocation of conduits, equipment, or accessories required to provide maintenance access shall be accomplished at no additional cost.
c. Equipment shall be installed with ample space allowed for removal, repair or changes to the equipment.
d. Ready accessibility to equipment and wiring shall be provided without moving other equipment which is to be installed or which is already in place.
e. Locate electrical outlets and equipment to fit the details, panels, decorating or finish at the space.
f. The Architect shall reserve the right to make minor position changes up to 10' of the outlets before the work has been installed.
g. Verify door swings before installing room lighting switch boxes and install boxes on the latch side of door unless noted otherwise.
h. Furnish information as to exact location and size of sleeves for openings for new construction.
i. Provide and set in place all required sleeves, inserts, forms, etc. and coordinate this work with all other divisions of work.

3. Cutting and patching.

a. Beams or columns shall not be pierced without permission of the Architect and then only as directed.
b. If any openings are required through walls or floors where no sleeve has been provided, the hole for the sleeve shall be core drilled to avoid all unnecessary damage and structural weakening.

c. Provide all cutting and patching required for complete installation of systems unless specifically noted elsewhere.
d. All new or existing work cut or damaged shall be patched and restored to its original condition.
e. Coordinate the location of sleeves, openings, chases, furred spaces, etc.
f. Provide during the progress of construction all sleeves, hangers and inserts that are to be built into the structure.
g. Provide sleeves for cables passing through masonry, concrete or other similar construction.
h. Sleeves shall be of metal conduit and shall extend completely through the construction.
i. Conduits or cables penetrating smoke or fire barriers must not destroy the barrier's integrity.
j. Grout openings between sleeves and concrete or masonry walls and floors.
k. Pack annular space between sleeves and conduits with fiberglass.
l. Where penetrations occur through fire rated walls or floors, fill space with fire resistive caulk.
m. Wherever cables must pass through fire or smoke rated walls or floors, provide approved, sleeved, foam filled fire stops around cables as manufactured by O.Z., Dow, Square D, or equal.
n. Provide all materials required for patching unless otherwise noted.
o. Where alterations disturb lawns, paving, walks, etc., the surfaces shall be repaired, refinished and left in the condition existing prior to commencement of work.

4. Excavation and backfill.

a. Backfilling of all trenches beneath concrete floor and stair slabs within building shall be accomplished with gravel fill and shall be specially compacted to same density as surrounding area.
b. Lines passing under foundation walls shall have a minimum of 1 1/2 inch clearance.
c. Care shall be taken to insure no disturbance of bearing soil under foundations.

5. Attachments and supports.

a. Be responsible for proper fittings and support for each item of equipment and materials installed under Division 26.
b. Be responsible for the proper application, installation and location of all necessary and required inserts, supports and anchor bolts.
c. Where same are to be installed by other Divisions of work, supply same to the contractor in whose work they occur with instructions for placement and proper installation.
d. Establish the method and nature and select accessories necessary for proper support appropriate to item and point of attachment with due consideration given to ambient/environmental conditions and service duty.

e. Attachments, supporting devices and accessories shall be specifically designed for the application, suitable for the duty imposed in service and acceptable to the Architect.
f. Attachments shall be made to structural components of the structure in such manner not to jeopardize the integrity of the structure and otherwise consistent with trade practices.
g. Generally, anchors shall be concrete insert type in poured concrete and drilled expansion type in precast concrete.
h. Powder actuated anchors shall not be used in concrete work.
i. Provide all mounting backboards as required to mount electrical and electronic equipment.
j. That equipment which is normally assumed to be mounted on some type of a backboard shall be mounted on backboards provided by Division 26.
k. All mounting backboards used by the contractor shall be 3/4" AC grade marine duty plywood.
l. All plywood shall be painted on both sides and edges with two coats of fire resistant white enamel paint.
m. Provide back mounting panels to meet this specification.
n. Steel channel interior to be painted or galvanized.
o. Exterior conduit mounting channel shall be stainless steel.
p. All sleeves to be furnished and installed by Division 26.

D. Installation: Temporary Electric Distribution

1. Reuse existing service to feed construction power as required.
2. All power consumption costs for the temporary service will be paid by the Owner.
3. Temporary power requirements other than the specified, shall be furnished by the Division of work requiring the same.
4. Installation of the temporary power and lighting system is to begin upon notification by the Architect and shall be installed and routed in manner acceptable to the Architect and the various trades so as not to interfere with construction of the project.
5. The temporary power and lighting system should be adequate for the construction of this project and in accord with OSHA Requirements for Construction Projects.
6. Provide a minimum of 20 foot candles of lighting in work areas for construction.
7. The temporary light and power system shall include fused main disconnect switch, panelboards, branch circuits, outlets, lamps and the maintenance thereof.
8. Temporary lights shall be equipped with heavy duty electric cords and guards.
9. Temporary lights must not be suspended by the power supply cord unless it is designed for this use.
10. Furnish 2 general purpose, 20 ampere, 120 volt, single phase, grounding type receptacle outlets for every 1000 square feet of floor space.
11. The maximum length of a 20 ampere, 120 volt lighting or power circuit shall not be greater than 200' from panelboard to farthest outlet.
12. All single phase receptacle outlet circuits shall have approved ground fault circuit interrupter protection or other OSHA approved protection systems.

13. Temporary power requirements, other than the specified, shall be furnished by the division of work requiring the same.

E. Installation: Trial Usage of Electrical Systems

1. The Electrical Engineer has the privilege of the trial usage of electrical systems or parts thereof for the purpose of testing under load the new installation and learning the operational procedures.
2. The trial usage shall be continued for a length of time as deemed reasonable by the Electrical Engineer and all related costs shall be included in the bid, with the exception of the electrical power cost which will be paid by the Owner.
3. The operations shall be carried out only with the express knowledge and under supervision of the responsible sub-trade who shall not waive any responsibility because of trial usage.
4. While trial usage will be kept to a minimum, it shall not be construed as acceptance by the Electrical Engineer.

F. Installation: Cooperation/Coordination

1. Coordinate and cooperate with other Divisions of work and Owner by scheduling and installing work to facilitate the construction progresses and the Owners use of the building.
2. Any deviation from contract plans shall be approved by the Electrical Engineer before proceeding.
3. Study the plans of other trade divisions of work and to fit work into the work of others in a coordinated manner.
4. Lay out work and be responsible for measurements.
5. Check facilities provided by others which require electrical connections and provide outlets suitably located for them.
6. Take such measurements as may be necessary to assure approved fitting and proper installation of his work and all other work depending thereon.
7. Cooperate with other contractors to avoid complications between the installation of electrical equipment and equipment installed by others.

G. Installation: Finish And Painting

1. Equipment and materials such as transformers, panels and switches, shall be furnished with the manufacturer's standard finishes, consisting of a prime coat and baked enamel finish coat, unless otherwise noted.
2. Roof mounted equipment and other exterior materials including support hardware shall have a factory or field applied prime coat and finish coat of color selected by the Owner's Representative.
3. In general painting will be done by other trades. Assume responsibility to coordinate work with the painters so that all equipment is installed prior to painting.
4. Assume responsibility for additional expense required to paint support channels, panel trims, flush junction box covers, fixture hangers and other electrical devices not in place prior to normal routine painting.

5. An undamaged finish is required on all equipment.
6. If finish becomes rusted, corroded, scratched, or flaked during storage or installation, be responsible for refinishing the equipment to the satisfaction of the Architect.
7. Finish painting on the job site is not required by the electrical contractor, except where noted.
8. Refer to other areas of this Division 26 for painting of equipment furnished by the Division 26.
9. Where painting is required to be done by the electrical contractor, the painting shall be done in accordance with the painting portion of the general specification.

H. Installation: Damage to Other Work

1. Assume responsibility for all damages resulting from the execution of work under Section 26 05 00.
2. Assume responsibility to adequately protect Division 26 work at all times.
3. All damages resulting from their operations shall be repaired, or the damaged portions replaced by the party originally performing the work (to the entire satisfaction of the Architect), and all cost thereof shall be borne by those responsible for the damage.

I. Installation: Clean-Up

1. At all times, keep the premises free from excessive accumulation of waste materials or rubbish resulting from work, including tools, scaffolding, and surplus materials and leave work room or it's equivalent, clean.
2. In case of dispute, the Architect may order the removal of such rubbish and charge the cost to the responsible Division of work as determined by the Architect.
3. At the time of final clean-up, all fixtures and equipment shall be thoroughly cleaned and left in proper conditions for their intended use.

J. Installation: Drawing Schedules And Details

1. The electrical drawings include a number of standard and job specific details.
2. These details may or may not be specifically referenced on the drawings and in the specification.
3. Assume that even if the detail is not specifically referenced, that it shall apply to this project. (As an example, if a detail is shown for the exterior mounted receptacles, but the detail is not referenced from the plan sheets, the contractor shall assume that all exterior mounted receptacles shall be installed per the detail.)
4. Details and schedules are shown as a means to aid the electrical contractor and are not meant to be all inclusive of all devices.
5. Assume responsibility for making takeoff of equipment required, (i.e., additional circuit breakers, motor connections, etc.) and ancillary equipment and appurtenances for a complete connection or circuit.
6. Verify all sizes of electrical equipment with shop drawings and nameplate rating of the equipment it serves.

K. Installation: Bid Drawings

1. It must be understood that electrical drawings and details bid drawings are diagrammatic.
2. Electrical drawings and details bid drawings are not intended to be shop drawings.
3. It is expected that it may be necessary to move conduit, outlets and/or equipment in some cases to get coordinated installation and such changes are considered a part of the Contract obligation without cost to the Owner.
4. No outlets or equipment shall be located where the usefulness and/or operation will be affected by the work of other trades, door swing, counter, equipment, etc.

L. Installation: Contract Termination Requirements

1. Furnish Owner with service manuals for all items furnished under this Contract.
2. Service manuals shall be complete with drawings, diagrams, operations and installation instructions and parts lists.

3.5 OWNER TRAINING

A. Provide as outlined in each specification section requiring owner training.

3.6 SPARE EQUIPMENT

A. Provide as outlined per section 26 05 04.

END OF SECTION 26 05 00

SECTION 26 05 01 – PROJECT SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. This specification covers those conditions that are particular to this project. This section further explains and outlines other portions of these specifications.

PART 2 - PRODUCTS

2.1 SPRINKLER SYSTEM FLOW

A. Verify all requirements of the sprinkler flow system. Assume the following:

1. Furnish all wiring for new and existing interconnecting equipment.
2. Connect to new and existing tamper and flow switches
3. Furnish connection from control panel to fire alarm panel and monitoring panel.
4. Furnish and install exterior, weatherproof, wall mounted strobe. Provide weather resistant, engraved, brass nameplate mounted adjacent to strobe which states "Sprinkler Flow".

2.2 DOOR POSITION SWITCHES, CARD READERS, DOOR ACCESS SYSTEM & CAMERAS

A. Provide all electrical work associated with wiring the door position switches, card readers, door access system, and cameras as shown on the drawings. See specification section 28 24 00.

B. This shall include the following:

1. Rough-in for box and conduit stub for devices
2. Wiring
3. Data outlets
4. See additional installation details

C. Include time in bid to meet with card access supplier and the reviewing of the card access supplier’s information. Provide all work as required and bid as part of division 26.

2.3 CASE WORK/CONNECTIONS TO BUILT-IN-PLACE & FREE-STANDING COUNTERS/DESKS

A. For those areas indicated as having a built-in-place counter or desk, provide the electrical equipment shown within the desk. All equipment items shall be cut into the work side front of the desk. Cut in all devices and conceal all conduits.

B. Coordinate the actual device locations with the Owner or in a meeting with the Owner and with the counter/desk supplier. For counters mounted adjacent to the wall, provide junction boxes in the wall, and wire from these junction boxes into the counter. Provide EMT or flexible conduits through the counter hollow spaces to the various outlets shown.

C. Provide all rough-in and all wiring hidden within the counter space to make connections to the equipment. Where low voltage-type outlets are shown, such as data or empty boxes, provide a minimum 3/4" conduit stubbed from the box shown into the floor, up the nearest adjacent wall to the ceiling space where the conduit shall be terminated and marked as to its function,.

2.4 WIRING OF HANDICAP ACCESSIBLE MOTORIZED DOORS

A. The handicap door operators will be furnished by other contractors. Provide wiring to the door and to the control. Work will consist of the following:

1. Verify rough-in requirements with door supplier and push button locations prior to start of work.
2. Provide all rough-in, conduit and wiring for pushbutton operators.
3. Wire any limit switches or other controls associated with the door.
4. Electrical contractor shall review the specifications to determine exact requirements.
5. Wire doors with electric strikes to open if inside door operator push paddle is activated

2.5 CORD REELS WITH RECEPTACLES

A. Provide Hubbell type industrial power cord reel. Provide where shown on the drawings. Cord reels shall be equipped with a duplex heavy duty rubber, extra depth box with two heavy duty duplex receptacles.

B. Provide receptacle for cord reel to plug into.

C. Make adjustments in cord catch ball so that cord end is located per owner's request.

D. Provide appropriate mounting attachment consisting of horizontal mounting plate or bar to securely attach cord reel. See details on drawings.

E. Cord to be 30' - #12/3 SJEO cord.

F. Manufacturers:

1. Cord reel:

a. Hubbell - HBL 125104 R220/GFI receptacle. No flip up receptacle lids

2.6 LOW VOLTAGE SYSTEM CABLE SLEEVES

A. Provide low voltage system cable sleeves throughout the building. Provide sleeves as follows:

1. All sleeves are to be steel and are to have insulated connectors on the end, or other type of cable protection.
2. Sleeves are to extend a minimum of 6” out from the wall.
3. A 1” sleeve shall be placed above the ceiling, through the wall, between all rooms and corridors or other areas where cables are to be routed.
4. In area where there is no finished ceiling, a conduit shall be extended from the communications outlet box, directly into an accessible ceiling area.
5. Cable shall be installed in conduit in all mechanical rooms, storage and any other open-structure rooms.
6. In addition to these sleeves, also provide the sleeves that are shown on the floor plans.
7. All low voltage devices in walls, including fire alarm devices, must have conduit stubbed from box in wall to above accessible ceiling.

2.7 MULTI-POLE CIRCUITS

A. Multi-pole circuits are not allowed for single-phase line to neutral loads.

2.8 COORDINATION STUDY

A. The electrical contractor shall be responsible for providing a breaker coordination study for the entire distribution system. This work shall be submitted to the local inspector and the engineer. See Specification Section 26 05 73. Provide coordination study prior to ordering the distribution equipment so changes are allowed if necessary.

PART 3 - EXECUTION

3.1 ALTERNATES

A. Review the alternate bid listing in the bid portion of the documents and bid the alternates under that number that coincides with the listed electrical alternates. See specification general conditions spec for additional Alternate bids.

1. Alternate Bid E-1: State the deduct from the Base Bid to furnish and install sound system per specifications 27 51 18
2. Alternate Bid E-2: State the deduct from the Base Bid to furnish and install sound system per specifications 27 51 19
3. Alternate Bid E-3: State the deduct from the Base Bid to furnish and install sound system per specifications 27 51 20
4. Alternate Bid E-4: State the deduct from the Base Bid to furnish and install sound system per specifications 27 51 21
5. Alternate Bid E-5: State the addition to the Base Bid to furnish and install two way paging intercom in lieu of one way system bid as base per specifications 27 51 24

END OF SECTION 26 05 01

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SECTION 26 05 02 - ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

2.2 ROUTING CONDUITS TO EXISTING FLUSH MOUNTED PANELS

A. Existing flush mounted panels are being reused to feed new equipment. Assume responsibility for installing new conduits into the panel. However, if existing conduits have adequate space, they may be reused for the additional circuits.

2.3 REMOVED PANELS

A. For each of the indicated removed panels, remove feeder, relabel breaker feeding panel “spare” or reuse as indicated on one line. Reuse panel if indicated on plans. Turn over all unused panels and breakers to owner Remove all existing secondary circuits, conduits and controls.

2.4 GENERAL DEMOLITION

A. This facility is provided with multiple services with multiple meters. The sub meters and ECB’s on the building exterior are to be removed. Remove all associated equipment, conduits and wiring. Patch wall to match surfaces. Coordinate removal with local utility. The existing main 2000 Amp service and all metering equipment is to remain.

B. This facility contains low voltage wiring from the previous tenant. All the existing low voltage cabling, equipment and conduit must be removed including the fire alarm system. Keep existing phone utility service entrance equipment in place. All other cabling from this point is to be removed.

C. The existing panels indicated to be removed must be turned over to owner. Remove all circuits, conduit, and any controls. Remove all unused conduits and cut flush with floor if routed under slab. Remove all conduits and j boxes in floor troughs scheduled to be filled in with concrete.

D. Remove all existing electrical on interior walls scheduled to be furred out. Install new devices in new furred out walls.

E. In areas where existing panels are scheduled to be removed and the removed panels fed receptacles in spaces that are to remain, they must be refed from the existing or new panels indicated to remain. Provide new conduit and wiring from the new or existing panels. Provide new breakers to feed the existing receptacles. All existing receptacles refed in areas with no work must be relabeled on face planes as to panels fed from. These specific receptacles are not shown on the plans. For bidding assume 15 total receptacles and 2 circuits. The EC must verify on site the exact quantity.

2.5 RELABELING OF EXISTING PANELS

A. Where there are existing panels in place, or existing panels in place being replaced by new, include new engraved plates for those panels indicating the new panel designations. Also include modifying the existing switchboard or power panel that feeds those panels and update those panels with new engraved nameplates indicating the new panel designation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Beginning of demolition means electrical & communication contractor accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical & communication systems in walls, floors, and ceilings scheduled for removal.

B. Coordinate utility service outages with Utility Company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Fire Alarm Systems: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner at least 48 hours before partially or completely disabling system. Minimize outage duration.

3.3 CONNECTIONS TO EXISTING EQUIPMENT

A. On remodeling projects there are various references made on the electrical & communication contract drawings which indicate connections to existing equipment and distribution panelboards. Visit the job site prior to assembling bid to investigate how to make connections to existing equipment. In many cases the plans do not specifically delineate how these connections are to be made.

B. Connections to existing panelboards, disconnects, wireways and switchboards shall be thoroughly investigated by the ELECTRICAL CONTRACTOR. For connections to existing panelboards "or existing panel in area" he shall provide circuit breakers installed within the existing equipment.

3.4 DEVICES IN EXISTING WALLS THAT REMAIN

A. In any areas where there are existing wiring devices or panelboards or other electrical & communication equipment that are no longer being used as part of the project, remove those wiring devices and panelboards, and in their place, provide a paintable steel, 16 gauge, finished plate. Use oval-head screws to attach plate to existing box. Grind edges smooth and round corners. Steel shall be cleaned and prime painted by the electrical & communication contractor for finish painting by other contractors. Prime paint shall be an oil-based paint or other primer that is compatible with the wall paint being used in the area where the cover is being installed.

B. If there is an existing device on or in the wall in an area where there is remodeling, and if that device is not indicated as being reused, include the cost to remove that device and patch the hole. However, prior to removal, verify with the Owner and Architect if this device is to be removed and not reused.

3.5 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Work with the general contractor and all other contractors to provide all electrical work as required to disconnect all electrical connections in the demolished area.

B. Remove, relocate, and extend existing installations to accommodate new construction.

C. For all removed electrical equipment, assume responsibility for removing the conduit and wire feeding that equipment back to back to power source. Remove all unused control wires and/or cable above demolished ceilings. All wire shall be removed back to the point of supply. If that equipment was connected to a circuit breaker, the wire to the circuit breaker shall be entirely removed and the circuit breaker shall be tagged as spare.

D. Assume that any circuits that are interrupted by the remodeling that require continued service shall be reconnected and routed around the remodeled area.

E. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

F. Disconnect abandoned outlet boxes and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlet boxes which are not removed.

G. Disconnect and remove abandoned panelboards and distribution equipment. Extend existing circuits as required to new panelboard or other panelboards with space.

H. Disconnect and remove electrical & communication devices and equipment serving utilization equipment that has been removed.

I. Disconnect and remove abandoned luminaries. Remove brackets, stems, hangers, and other accessories.

J. Repair adjacent construction and finishes damaged during demolition and extension work.

K. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.

L. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

M. Check with Owner to determine if the Owner wants to retain the removed equipment. If so, move it to the Owner's storage, assumed not to be in the same building, but within 5 miles of site. If not, remove material and dispose of properly at own expense.

3.6 EXISTING CEILING WORK

A. In areas where ceilings are being removed and reinstalled or to facilitate installation of ductwork or other mechanical systems above the ceilings, or where the ceilings remain in place and other mechanical systems are installed above the ceiling, assume the following:

1. Junction boxes that are located above the new mechanical equipment, including ductwork, HVAC piping, plumbing piping or mechanical equipment shall be relocated to provide code required box clearances.
2. Junction boxes that are located above the new ductwork which are no longer accessible, are to be relocated into an area of accessibility.

B. In areas where existing ceilings are to be removed and new ceilings are being installed in the area, assume the following in regard to work in those spaces:

1. Existing conduit and cables above the existing ceilings shall be required to be reinstalled when the old ceiling is removed. Assume the existing conduit is attached to the old ceiling and by the old ceiling being demolished, will also be removed. Ceiling mounted junction boxes shall feed the existing switches; new light fixtures or existing light fixtures, if they are to remain; and all existing receptacles and other electrical equipment in the area.
2. All existing cable shall be resupported off of ceiling grid as required.

3. All existing conduit shall be resupported to comply with NEC.

3.7 EXISTING WALLS WITH NEW WALL FINISHES

A. On existing walls that are covered with new wall finishes, remove the existing device and plate

3.8 REMOVAL OF EXISTING LIGHT FIXTURES

A. For the removal of all existing light fixtures, provide proper disposal of all light fixture components including ballasts and lamps.

3.9 RECONNECTION TO EXISTING CIRCUITS

A. Where it is indicated on the drawings as 'reconnect to existing circuit' assume that the note references reusing the panelboard circuit. Make determination if existing raceways and conductors are in place for that connection. Extend the circuit from the new equipment back to the point where conduit and wire are available. Coordinate with the demolition contractor to maintain conduits and conductors that the electrical contractor may require to remain in place for reuse. Provide new raceway supports, conduit extensions, and circuit extensions as required.

3.10 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

3.11 ELECTRIC SERVICE REVISIONS

A. Coordinate electric service installation with building construction. Include in bid temporary costs associated with keeping the existing electrical service operating until the new service is installed.

B. Extend feeders from the existing electrical service, to the new distribution panelboards as shown on the floor plan.

C. Visit the site prior to bid to determine the best feeder routing, from the existing main service, to the new distribution panelboards. Route the conduit concealed where in finished areas. This routing may be above ceilings. Conduits may not be on roof.

D. Work with the Owner to install the new electrical & communication service within the Owner's use of the building. Assume that all power outages shall be done on an overtime basis and shall include the same in bid. Work with the Owner to determine if shut down can be accomplished on a day when the facility does not require power. Determine the best way to install the new service so as to provide a minimum of downtime.

E. All existing service entrance equipment that is no longer required shall be removed in its entirety. Any openings left in the walls or ceiling shall be patched back to the same type of wall surface as the existing. For ceiling penetrations provide insulation to match existing and hire approved roofing contractor to patch openings.

3.12 EXISTING PANEL REMOVAL

A. Where existing panels are being removed as a part of the electrical construction, assume that all existing circuits within that panelboard shall be extended into the nearest panelboard.

1. Determine the circuit connections of the removed panels and provide all appropriate circuit breakers in the new panelboards.
2. Determine raceway routing of existing panelboard and include in bid the cost to extend those raceways and associated branch circuits to the new panelboard. Provide junction box above ceiling or in floor below as required to extend circuits.

3.13 REMOVAL NOTES ON DRAWINGS

A. The removal notes on the drawings are meant to aid the contractor to remove items that the contractor may normally leave in place because the room remains similar.

B. It is the intent that these removed devices are devices that are in addition to the other devices that must be removed, bypassed, etc. as a part of the demolition work.

C. Disconnect, remove, and close openings of all electrical equipment that serve functions in existing rooms when those rooms change function. Clarify this with the Owner and Architect prior to removal.

END OF SECTION 26 05 02

SECTION 26 05 04 – DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

1.2 SYSTEM PRE-INSTALLATION INFORMATION

A. Provide system pre-installation information for all equipment indicated on the Project Documentation Submittal List. Information shall include:

1. System wiring diagrams:

a. System wiring diagrams for the systems listed below shall be provided as a complete riser diagram. This riser diagram shall include all components of the system, as well as a designation adjacent to each component indicating the room or space in which it is located. Cable type used shall also be identified. This designation shall be by description of space or by room number.

1) Spec section 27 10 00 – structured cabling system.
2) Spec section 28 23 00 – security camera system .
3) Spec section 28 24 00 – access control.
4) Spec section 28 31 10 – voice addressable fire alarm.

2. Diagram format:

a. All riser diagrams shall be done in the following manner:

1) CAD drawings.
2) All symbols used shall be the same symbols that are used on the electrical contract documents.

b. Each component of the built-up system must have the following information provided:

1) Each component must be indicated on a riser diagram and shown how it interconnects to other parts of the system.
2) Provide front elevation of rack or enclosure for system.
3) Size of enclosure shall be indicated.
4) Spacing or special mounting requirements shall be indicated.
5) Signal candela level.

DATA CABLE LISTING

PROJECT_____

LISTED BY PATCH PANEL JACK

Rack Location	Rack Number	Patchpanel Number	Patchpanel Jack Number	Cable Number	Room Number	Room Jack Number

MSA PROFESSIONAL SERVICES, INC.
116 FREMONT STREET
KIEL, WI 53042
(920) 894-7800

DATE MADE_____

PAGE _____ OF _____

B. System installation information shall be updated to reflect the installed system. This updated information shall be included as a part of the final O&M manual.

C. Drawings shall be supplied for each existing building system that is revised or added to. The drawings do not have to show all existing building equipment, only those items where the new system is extended from. A brief description should be given of the existing system and how it was extended.

D. Record drawings shall be reduced to 11" X 17" or 8 1/2" x 11" and included with the equipment drawings in the final O&M manual. See O&M MANUAL Description in this specification section.

1.3 FINAL TESTS AND DEMONSTRATIONS

A. Test all work and all equipment installed to ensure its proper and safe operation. Check all interlocking and automatic control sequences, and test the operation of all safety and protective devices. Rectify all defects. Coordinate this work with the Power Company, supplier's representative and all other persons as directed by the OWNER or his representatives, in order to achieve the proper and intended operation of all equipment.

B. Test, adjust and record operating voltages at each system level before energizing branch circuits. Transformer taps must be adjusted to obtain as near as possible nominal system voltage. Where transformer is under Utility jurisdiction, obtain services of Utility to correct voltage. Be responsible for replacement of all devices and equipment damaged due to failure to comply with this requirement.

C. Balance load among feeder conductors at each panelboard, and reconnect loads as may be necessary to obtain a reasonable balance of load on each phase. Electrical unbalance shall not exceed 10%.

D. Provide all instruments and equipment necessary to perform required tests.

E. All checks and tests shall be permanently recorded and made available to the OWNER or his representatives. The tests shall include:

1. System grounding
2. Fuses:

    a. Equipment nameplate requirement
    b. Actual fuse rating

3. Breakers:

    a. Nameplate
    b. Actual rating

4. Motors:

   a. Complete nameplate data
   b. Overload relay element
   c. Voltage and current phase readings
   d. Direction of rotation

5. Ampere readings on any cable operating in parallel to insure an even division of current.

F. The above reading shall be made for all fuses, breakers, motors and parallel cables installed as part of this contract and connected to by Division 26. This testing shall be for all new equipment, whether furnished by the electrical contractor or not.

G. Upon request, demonstrate proper operation of all electrical systems and equipment in the presence of the Architect's Consulting Electrical Engineer and/or other designated persons.

1.4 PROJECT CLOSEOUT CHECKLIST

A. Submit the following:

ITEM:	SUPPLIED TO:	CHECK OFF:
Spare Lighting Fixtures (SPEC 26 51 13)	OWNER	_____
Structured Wiring Documentation (SPEC 27 10 00)		
Structured Wiring Tabulations (SPEC 27 10 00)	ARCHITECT	_____
Structured Wiring Reduced Floorplans (SPEC 27 10 00)	ARCHITECT	_____
Structured Wiring Data Warranty (SPEC 27 10 00)	ARCHITECT	_____
Data Cable Installation Warranty (SPEC 27 10 00)	ARCHITECT	_____
Structured Wiring Documentation (SPEC 27 10 00)		
Structured Wiring Tabulations (SPEC 27 10 00)	ARCHITECT	_____

Structured Wiring Reduced Floorplans (SPEC 27 10 00)	ARCHITECT	_____
Structured Wiring Data Warranty (SPEC 27 10 00)	ARCHITECT	_____
Data Cable Installation Warranty (SPEC 27 10 00)	ARCHITECT	_____
Letter stating all specified spare equipment was delivered to owner. The letter should list the equipment supplied.	ARCHITECT	_____
Spare Fire Alarm Equipment (SPEC 28 31 10)	OWNER	_____
Fire Alarm Checklist (SPEC 28 31 10)	ARCHITECT	_____
Voucher for technician services as specified in 28 31 10. Submit voucher to school district. Provide letter indicating voucher was sent to owner.	ARCHITECT	_____
O&M Manual	ARCHITECT	_____
Certificate from systems suppliers stating that the system was started up, tested and Owner's instructions were given. Certificate shall have date of instructions and test and shall have the owner's representative's signature.	ARCHITECT	_____
Copy of marked up record drawing.	ARCHITECT	_____
Provide warranty for all equipment	ARCHITECT	_____

END OF SECTION 26 05 04

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SECTION 26 05 05 – THROUGH-PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 APPLICABLE PUBLICATIONS

A. Fire Test Requirements

1. ASTM E-814, “Fire Tests of Through Penetration Fire Stops”.
2. ANSI/ UL1479, “Fire Tests of Through Penetration Fire Stops”
3. ASTM E-119, “Fire Tests of Building Construction and Materials”.
4. ANSI/ UL263, “Fire Tests of Building Construction and Materials”.
5. ASTM E-84, “Surface Burning Characteristics of Building Materials”.
6. ANSI/ UL723, “Surface Burning Characteristics of Building Materials”.

B. References

1. Underwriters Laboratories (UL) of Northbrook, IL “Fire Resistance Directory”.

a. Through Penetration Firestop Systems (XHEZ)
b. Fill, Void or Cavity Materials (XHHW)
c. Firestop Devices (XHJI)
d. Forming Materials (XHKU)

2. All major building codes:

a. Uniform Building Code published by ICBO
b. Standard Building Code published by SBCCI.
c. National Building Code published by BOCA.
d. International Building Code published by ICC.

3. National Fire Protection Association (NFPA) of Quincy, MA “NFPA 101: Life Safety Code”.
4. National Fire Protection Association (NFPA) of Quincy, MA “NFPA 70: National Electrical Code”.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete firestopping installation as specified herein.

B. This section includes through-penetration firestop systems for electrical equipment and penetrations through the following fire-resistance rated assemblies, including both blank openings and openings containing penetrating items such as conduits, cabling, cable trays and bus duct:

1. Floor-ceiling assemblies.
2. Roof-ceiling assemblies.
3. Walls and partitions.
4. Smoke barriers.
5. Construction enclosing compartmentalized areas.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28 – Electrical

1.5 SHOP DRAWINGS

A. Product Data: For each type of through-penetration firestop system product indicated.

B. System Drawings: Submit documentation from a qualified third-party testing agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Product Certificates: Certificate of conformance signed by manufacturers of through-penetration firestop system products certifying that products comply with requirements.

1.6 OPERATION & MAINTENANCE MANUALS (NONE)

1.7 QUALITY ASSURANCE

A. Provide through-penetration firestop systems that comply with the following requirements:

1. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop system products bear classification marking of qualified testing and inspection agency.
3. Engage an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements. A manufacturer’s willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualifications on buyer.

B. Obtain through-penetration firestop systems for each type of penetration and construction condition indicated from a single manufacturer.

C. Through-penetration firestop systems shall be subjected to necessary inspections and tests.

D. Keep areas of work accessible until inspection by authorities having jurisdiction.

E. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Performance Requirements

1. Provide products that upon curing do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.
2. Openings within walls and floors designed to accommodate cabling systems subjected to frequent cable changes shall be provided with re-enterable products specifically designed for retrofit.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through-penetration firestop systems (XHEZ) listed in Volume 2 of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Manufacturers listed in the UL Fire Resistance Directory – Volume 2.

2.3 MATERIALS

A. General: Use only through-penetration firestop system products that have been tested for specific fire-resistance-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Latex Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture.

C. Firestop Devices: Factory-assembled steel collars lined with intumescent material sized to fit specific outside diameter of penetrating item.

D. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds.

E. Firestop Putty Pads: Intumescent, non-hardening putty pads to be installed on metallic and nonmetallic electrical switch and receptacle boxes to reduce horizontal separation between boxes to less than 24”.

F. Wrap Strips: Single component intumescent elastomeric strips faced on both sides with a plastic film.

G. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated with an intumescent coating contained in a flame retardant poly bag.

H. Mortar: Portland cement based dry-mix product formulated for mixing with water at Project site to form a non-shrinking, water-resistant, homogenous mortar.

I. Silicone Sealants: Moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or nonsag) or vertical surface (nonsag).

J. Silicone Foam: Multicomponent, silicone-based liquid elastomers, that when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.

3.3 DELIVERY STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Accept equipment on site. Inspect for damage.

C. Protect equipment from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instructions for multicomponent materials.

E. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.

3.4 INSTALLATION

A. General Requirements: Install through-penetration firestop systems in accordance with "Performance Criteria" Article and in accordance with the conditions of testing and classification as specified in the published design.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration firestop systems products.

1. Seal all openings or voids made by penetrations to ensure an air and water resistant seal.
2. Protect materials from damage on surfaces subjected to traffic.

C. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

D. Clean all surfaces adjacent to sealed openings to be free of excess through-penetration firestop system materials and soiling as work progresses.

E. Project conditions

1. Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limitations recommended by manufacturer.
2. Do not install through-penetration firestop systems when substrates are wet due to rain, frost, condensation, or other causes.
3. Do not use materials that contain flammable solvents.

4. Do not install water-based or products that are conductive when wet in contact with energized electrical conductors. Exercise care when energizing penetrants.

F. Coordination

1. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
2. Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration firestop systems.
3. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

G. Preparation

1. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.
2. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
3. Do not proceed until unsatisfactory conditions have been corrected.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 05

SECTION 26 05 19 – WIRE AND CABLE

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

1. NFPA 70 – National Electrical Code.
2. ANSI/TIA/EIA-568-B.2.

B. National Electrical Contractors Association (NECA), Standard of Installation, current edition.

C. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.

D. Underwriters Laboratories, Inc. (UL).

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete and operable wire and cable system as indicated on the drawings and as specified herein.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the items listed above:

1. Manufacturer literature in scope to demonstrate compliance with the requirements of this specification.
2. Clearly identify the types of wire and cable proposed.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. Wire and cable manufacturers shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development and production in accordance with ISO 9001.

C. All materials, equipment, and parts shall be new and unused of current manufacture.

D. Provide all necessary accessories required for a complete and operable system.

1.8 WARRANTY

A. Wire and cable shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. Approved manufacturer:

1. Contractor’s option.

B. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 WIRE AND CABLE – GENERAL PURPOSE (600V)

A. General:

1. All conductors shall be copper.
2. THWN or THHN general purpose building wire insulated with polyvinyl chloride (PVC) and covered with protective sheath of nylon intended for lighting and power circuits at 600 volts or less, in residential, commercial, and industrial buildings.
3. The wire shall be suitable for 90ºC maximum continuous conductor temperature in dry locations and 75ºC in wet locations and listed by Underwriters Laboratories for use in accordance with Article 310 of the National Electrical Code.

B. Conductors:

1. Class B or Class C stranded, annealed uncoated copper per UL Standard 83 or 1063.

C. Insulation:

1. Each conductor shall be insulated with PVC and sheathed with nylon complying with the requirements of UL Standard 83 for Types THHN or THWN and UL Standard 1063 for Type MTW and CSA C22.2 No. 75 for T90 Nylon.
2. Types THWN or THHN shall comply with the optional Gasoline and Oil Resistance rating of UL Standard 83. The insulation shall also comply with UL requirements for 105ºC Appliance Wiring Material.
3. The average thickness of PVC insulation, for a given conductor size, shall be as specified in UL Standard 83 for TWHN or THHN. The minimum thickness at any point, of the PVC insulation, shall be not less than 90 percent of the specified average thickness.
4. The minimum thickness at any point of the nylon sheath shall be as specified in UL Standard 83 for Types THWN or THHN.
5. The PVC insulation shall be applied tightly to the conductor and shall be free-stripping.

D. Identification:

1. The wire shall be identified by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL Symbol, type designations, and optional ratings. The wire shall also be identified as C (UL) Type T90 Nylon or TWN 75, FT1.

E. Tests:

1. Wire shall be tested in accordance with the requirements of UL Standard 83 for Types THWN or THHN wire and for the optional Gasoline and Oil Resistance listing; as Type MTW to UL Standard 1063 (stranded items): as AWM to UL Standard 758 (stranded items); and as C(UL) Type T90 Nylon or TWN75.

F. Usage:

1. General use power wiring, minimum size No. 12 AWG.
2. General use control wiring, minimum size No. 14 AWG.

2.3 WIRE AND CABLE – UNDERGROUND (600V)

A. General:

1. USE-2 or RHH, cross linked polyethylene insulated cables for use in circuits not exceeding 600 volts. Cables listed by UL as Type USE-2 and recognized for underground use in wet locations at a maximum continuous conductor temperature of 90ºC in accordance with Article 338 of the National Electric Code.

2. UL listed as Type RHH or RHW-2 for general purpose wiring applications at maximum continuous conductor temperature of 90ºC in dry locations (RHH) or 90ºC in wet or dry locations (RHW-2).
3. Installed in air, conduit, or other recognized raceways in accordance with Article 310 of the National Electric Code.

B. Conductors:

1. Conductors shall be Class B stranded annealed uncoated copper per UL Standard 854 and 44.
2. A suitable separator over the conductor may be used at the option of the manufacturer.

C. Insulation:

1. Each conductor shall be insulated by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL Symbol, and type designations.

D. Tests:

1. Wire shall be tested in accordance with the requirements of UL Standard 8654 for Type USE-2, UL Standard 44 for Types RHW-2 or RHH.

E. Usage:

1. Underground power wiring, minimum size No. 12 AWG.

2.4 PORTABLE CORD GENERAL USE

A. All portable general use cords shall be SO type.

2.5 WIRING CONNECTORS

A. Polaris Type Mechanical Connectors:

1. 8 AWG and larger wire for all motor connections.

B. Spring Wire Connectors:

1. 10 AWG and smaller wire.

C. Compression Connectors (T&B Sta-Kon or equal):

1. Fire alarm wiring.
2. Control wiring.
3. For those devices that are not rated to accept stranded wire.

D. Cord Connectors. All cord connectors should be Kellums type using wire mesh cord restraint.

E. Provide watertight Crouse-Hinds or equal cord grips in appropriate areas.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that wire is in compliance with specifications.

B. Verify that interior of building has been protected from weather.

C. Verify that mechanical work likely to damage wire and cable has been completed.

D. Inspect wire for physical damage and proper connection.

E. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

F. Verify continuity of each conductor.

G. Feeder or branch circuits with ampacity greater than 100 amperes shall be tested after installation to measure insulation resistance of each conductor.

1. All equipment shall be disconnected and the wire ends shall be cleaned and dried.
2. Connect Megohmeter between conductor and a grounded point in the enclosure and energize until the reading stabilizes.
3. The Megohmeter reading for each conductor shall not be less than 10,000 Megohoms.

3.2 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base on contract drawings.

B. Identify conflicts with the work of other trades prior to installation of work.

C. Adjust system to satisfy field requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Maintain original quality and condition of wire while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.

2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

B. Pre-Installation:

1. Verify that interior of building has been protected from weather.
2. Verify that mechanical work likely to damage wire has been completed.
3. Completely and thoroughly swab raceway prior to installation.
4. Verify that field measurements are as shown on drawings.
5. Wire and cable routing shown on drawings is approximate unless dimensioned. Route wire and cable to satisfy project conditions.
6. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.
7. Determine required separation between cable and other work.
8. Determine cable routing to avoid interference with other work.

C. Conductor Sizing:

1. Conductor sizes are based on copper.
2. Use conductor not smaller than No.12 AWG for power and lighting circuits.
3. Use No.10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.
4. Where circuit wiring length exceeds 100 feet, increase wire size as needed to maintain a maximum voltage drop of three percent.
5. Use conductor not smaller than No.14 AWG for control circuits.
6. Wire and cable size shall be increased from size indicated or required by code to meet the following voltage drop requirements:

    a. 3% drop for branch circuits.
    b. 5% drop for motor circuits.

D. Wire Pulling:

1. Pull all conductors into raceway at same time.
2. No.4 AWG and larger wire and power cables shall be lubricated with pulling lubricant to reduce pulling tension and abrasion damage. The lubricant shall be water or wax based containing no oils or greases that may adversely affect cable jackets. Follow cable manufacturer's specifications regarding use of lubricant.
3. The minimum bend radius and maximum pulling tension ratings of the wire and cable shall not be exceeded.

E. Splices and Terminations:

1. Splices and terminations shall not be made within raceways.
2. Clean conductor surfaces before splicing or terminating.
3. Make splices, taps, and terminations to carry full amp capacity of conductors with no perceptible temperature rise.

4. Wire nuts, “ScotchLocks”, and similar devices may be used to splice 120V power circuits.
5. Control, communication, and data transmission wire and cable shall not be spliced.
6. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels or support for the ceiling suspension system per NEC.
7. Neatly train and lace wiring inside boxes, equipment, and panelboards.
8. Clean conductor surfaces before installing lugs and connectors.
9. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
10. Use polaris type mechanical connectors for copper conductor splices and taps, 8 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
11. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

F. Motors:

1. Motor wiring to motors less than 10 horsepower shall be spliced and terminated with fully insulated crimp-on end cap with a layer of self-vulcanizing rubber tape, followed by five layers of vinyl electrical tape. “SkotchLocks” and similar devices shall not be used.
2. Motor wiring to motors 10 horsepower or larger shall be spliced and terminated with crimp-on ring terminal lugs, brass nuts, bolts and washers with a layer of self-vulcanizing rubber tape, followed by five layers of vinyl electrical tape. “SkotchLocks” and similar devices shall not be used.

G. Wire Marking:

1. The ends of each conductor shall be marked with circuit number, motor number, wire or terminal number.
2. Labels shall be typed in black lettering with indelible ribbons on a white, heat shrink sleeve. Markers shall be shrunk around the wire to provide a tight, non-slip bond with a compatible heat gun.
3. Heat shrink wire markers shall be Brady Bradysleeve Type B-321 or B-322

	120/208V System
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

H. Ground Wire Color Coding

1. Provide green insulated ground wire for #8 and smaller. #6 wire shall have green band per code.

I. Control Panels:

1. Control panel wiring. Wiring within control cabinets shall be stranded type MTW.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 19

SECTION 26 05 26 – GROUNDING

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

C. Conform to current Telecommunication Industry Association (TIA/EIA).

D. Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

E. Product specific standards and requirements are included in product specifications.

F. EIA/TIA-607.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete and operable grounding and bonding system as indicated on drawings and specified herein.

B. Ground and bond all equipment required per all applicable codes whether or not specifically shown on drawings.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Complete riser diagram indicating copper backbone from main service ground to telecommunications ground bus.

1.6 OPERATION & MAINTENANCE MANUALS (NONE)

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

1.8 WARRANTY

A. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. Submit a written warranty executed by the installer indicating ground test was completed.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Provide a complete and fully functional grounding system using materials and equipment of types, sizes, and rating as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions. Provide all accessories necessary for a fully functioning system.

2.2 MECHANICAL CONNECTORS

A. The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers, and lockwashers shall be made of silicon bronze and supplied as a part of the connector body and shall be of the two bolt type.

B. Split bolt connector types are not allowed.

C. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

2.3 COMPRESSION CONNECTORS

A. The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99 percent.

B. The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.

C. The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.

D. The connectors shall be clearly marked with the manufacturer, catalog number, conductor size, and the required compression tool settings.

E. Each connector shall be factory filled with an oxide-inhibiting compound.

2.4 WIRE

A. Material: Stranded copper (aluminum permitted only with aluminum conductors).

B. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, in specifications, or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used on the same facility.

2.5 TELECOMMUNICATIONS GROUND BUS BAR

A. Telecommunications main grounding busbar (TMGB).

1. Provide a pre-manufactured ground bus attached to the wall or rack enclosure per drawings.
2. Bus shall be equipped with six connection points for #10 or smaller wire, using set screws to capture the wire. This is in addition to the termination points for the grounding backbone and the jumpers to the telecommunications system.
3. See details for equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

3.2 FIELD MEASUREMENTS

A. Field verify exact routing of all backbone cable.

B. Adjust grounding system installation to satisfy field requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

3.4 INSTALLATION

A. General:

1. Provide a separate, insulated equipment grounding conductor in all raceways.
2. Connect grounding electrode conductors to metal water pipe:

    a. Use a suitable ground clamp.
    b. Make connections to flanged piping at street side of flange.
    c. Provide bonding jumper around water meter.

3. Provide ground wire in all surface metal raceways, and wireways.
4. Receptacle grounding:

    a. For all receptacle circuits, provide separate green ground wire in raceway system.
    b. Standard receptacles may be used, and green wire shall be directly connected to receptacle or to pigtail.
    c. Provide #12 pigtail to ground all metal boxes.
    d. Stranded wire twisted on ground terminal on device is not allowed.

B. Telecommunication Ground Points

1. Telecommunications main grounding bus bar (TMGB).

    a. Adjacent to each TMGB, provide warning label with the following wording:

"WARNING"
If this conductor or cable is
loose or must be removed
please call the building
telecommunications manager.

    b. Install per riser diagram detail.
    c. Provide a pre-manufactured ground bus attached to the enclosure wall.
    d. Terminate ground wire on bus.
    e. Bond bus to enclosures and cable tray.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 26

SECTION 26 05 29 – SUPPORTING DEVICES

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

B. Conform to current American National Standards Institute (ANSI) standards.

C. Conform to current American National Standards Institute ANSI B31.1 standards.

D. Conform to National Electrical Contractors Association (NECA) “Standards of Installation”

1.3 DESCRIPTION OF WORK

A. Furnish and install complete and operable support devices as required.

B. Metal supporting devices shall be zinc galvanized or cadmium plated steel or malleable iron.

C. Equipment and materials shall be supported with devices designed for such purpose. Wire or plastic ty-raps not acceptable.

D. Where so specified on the drawings, provide stainless steel, PVC covered, or hot dipped galvanized.

E. Refer to drawings or other portions of the specifications for particular pieces of equipment which may require more stringent equipment specifications than listed in this specification.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS (NONE)

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 LIGHTING FIXTURE SUPPORT

A. Provide items such as stems, hickeys, bar hangers, and clips required to securely attach fixtures to ceilings or walls.

B. Provide troffer arms for supports, lay-in troffers for exposed grid ceiling and grid troffer support clips in accordance with NEC and manufacturer’s recommendations.

C. Provide and install channel supports across main grid runners or grid supports, securely tied down or anchored for fixtures and devices mounted in suspended ceiling systems not causing tile to sag and so fixture or device cannot be lifted, rotated or displaced.

D. Provide spacers or stabilizers to eliminate fixture instability.

E. Drilled expansion insert type anchors suitable for load and application requirements such as sleeve anchors, lag shields, and plastic anchors.

F. Provide auxiliary supports so fixtures can be drawn up tightly, tilted or rotated, and not affected by vibrations.

2.3 SUPPORTING STRUCTURES

A. Rack supports of galvanized steel channel sections with adequate feet to allow secure mounting. Weld sections, do not use bolts.

2.4 MOUNTING EQUIPMENT

A. For all panelboard, starters, disconnects, VFDs, control panel, etc. provide mounting panels of not less than 1/4 in. steel plate or 3/4 in. exterior grade plywood. Provide uniform mounting panels as far as practical. Paint plywood panels with 2 coats of fire rated gray enamel paint on all sides and ends.

2.5 CONDUIT SUPPORTS

A. 1- hole galvanized steel straps for EMT, 2-hole galvanized steel straps for all other conduits. Do not use perforated hanger iron.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify locations prior to rough in.

B. Verify mounting details

3.2 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Accept equipment on site. Inspect for damage.

C. Protect equipment from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer’s recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer’s recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not fasten supports to pipes, ducts, mechanical equipment, or other conduit.

D. Do not use spring steel clips on ceiling support wires.

E. Do not use powder actuated anchors.

F. Obtain permission from Architect before drilling or cutting structural members.

G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present a neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

H. Install surface mounted cabinets and panelboards with minimum of four anchors.

I. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.

J. Use steel metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

K. Degrease and clean surfaces to receive nameplates and labels.

L. Install nameplate and label parallel to equipment lines.

M. Secure nameplates to equipment fronts using screws if so, specified on drawings.

N. Anchors:

1. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31 and transfer of loading and stresses to connected equipment.
2. Installation methods shall be in conformity with manufacturer's recommendations for maximum holding power.

O. Conduit Supports

1. Support conduit as follows:

   a. Vertical Surfaces: Galvanized, heavy-duty, sheet steel straps; back straps provided for exposed conduit and conduit on exterior walls.
   b. Horizontal Surfaces: Single or double rack channel trapeze, complete with conduit straps as required; supported with threaded hanger rods.

2. Support 1 3/4 in. and larger conduit runs passing through floors at each floor with riser pipe clamps.

P. Conduit Extending Through Roof:

1. Conduit extending through roof shall pass through ceiling box at roof line.

2. Provide 14 ga minimum galvanized 12 gauge box complete with watertight soldered seams and flanged to serve as pitch pocket for each conduit or provide a neoprene boot as compatible with roof.
3. Install conduit and pitch pocket in advance of roofing work.
4. Coordinate with roofer for providing all appurtenances required so that the installed system complies with roofing installation.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 29

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SECTION 26 05 34 – RACEWAYS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

B. Conform to current National Electrical Manufactures Association (NEMA) Standards.

C. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

D. Conform to current Telecommunication Industry Association (TIA/EIA).

E. Conform to current American National Standards Institute (ANSI) standards.

F. Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

G. Product specific standards and requirements are included in Product Specifications.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete and operable conduit/raceway system as indicated on the drawings and as specified herein.

B. All wire shall be in conduit or surface raceway. All conduits in finished areas shall be concealed. In unfinished areas, such as utility and mechanical rooms, the contractor shall conceal the branch wiring such as receptacles and light switches.

C. Where conduit passes through areas of differing temperatures, such as into or out of cool-rooms, freezers, unheated and heated spaces, buildings, provide listed conduit seals to prevent the passage of moisture and water vapor through the conduit.

D. When remodeling in existing construction, all conduit shall be concealed in walls, above ceiling, or below floors and located within building.

E. When remodeling in existing construction and it is impossible to conceal conduit, a surface metal raceway shall be used where the raceway is used for 110 volt or greater power, where subject to physical damage, and for fire alarm wiring.

F. Materials Included:

1. Metal conduit.
2. Flexible metal conduit.
3. Liquidtight flexible metal conduit.
4. Electrical metallic tubing.
5. Nonmetallic conduit.
6. Surface metal raceways.
7. Wireways.
8. MC cable.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts are to be new, undamaged and unused of current manufacture.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 CONDUIT GENERAL REQUIREMENTS

A. Minimum Size: 1/2 inch.

B. Conduit types not listed below are prohibited.

C. Rigid heavy wall galvanized steel conduits:

1. Are to be used in the following locations:

a. Outdoors.
b. Underground, unless PVC is shown on drawings or called out in other portions of this specification.
c. In and under ALL concrete slabs, except for where PVC is allowed as stated in nonmetallic conduit portion of this specification.
d. In sizes 2-1/2" and larger, where the conduit is exposed and where it is installed between the floor and 8' AFF. Above this height EMT conduit may be used.
e. In areas having moisture, dust or gases.
f. Exposed conditions where such mechanical protection is required.

2. Manufacturer: CONTRACTOR option.
3. Conduit:

a. Impact and crush resistant mild steel tube with an accurate circular cross section, a uniform wall thickness, a defect free interior surface, and a continuous welded seam.
b. Interior and exterior surfaces thoroughly and evenly coated with zinc using the hot-dip galvanizing process.
c. Top-coated with a compatible organic layer to inhibit white rust and increase corrosion resistance.
d. Factory cut threads, 0.75-inch taper per foot, protected after cutting with an application of molten zinc.

4. Conduit Bodies:

a. Ferrous metal construction electro-galvanized inside and out and coated with aluminum acrylic paint.
b. Tapered, threaded hubs with integral bushing.
c. Stainless steel hardware.
d. Cover constructed of same material with solid gasket.

5. Fittings:

a. Ferrous metal construction electro-galvanized inside and out.

b. Components critical to performance such as set screws, split rings, and locknuts constructed of hardened steel or adequately designed to insure positive bonds.

D. Thinwall conduit:

1. May be used in the following locations:

a. Indoors in dry locations (walls, ceilings, exposed).
b. In sizes 2 1/2" and larger, where installed above ceilings or installed more than 8' above the floor. See paragraph B - Rigid heavy wall conduit.

2. Manufacturer: CONTRACTOR option.
3. Conduit:

a. Mild steel tube with an accurate circular cross section, a uniform wall thickness, a defect free interior surface, and a continuous welded seam.
b. Interior and exterior surfaces thoroughly and evenly coated with zinc using the hot-dip galvanizing process.

4. Fittings:

a. Setscrew, steel construction electro-galvanized inside and out.
b. Insulated throat connectors.
c. Components critical to performance such as set screws, split rings, and locknuts constructed of hardened steel or adequately designed to insure positive bonds.

E. Flexible Conduit:

1. Lengths limited to minimum necessary, 6' maximum.
2. Limit use to dry areas.
3. For connection of lighting fixtures, motors and similar equipment.
4. To contain an equipment grounding conductor with phase conductors.
5. Bond grounding conductor to equipment served and nearest conduit system junction box.
6. Manufacturer: CONTRACTOR option.
7. Usage:

a. Use only in conjunction with electrical metallic tubing

8. Conduit:

a. Single strip, helically wound, galvanized steel with smooth interior surface conforming to applicable UL Standards.

b. Minimum size 1/2-inch may be used in lengths not to exceed 3-feet. All runs of flexible conduit shall be as short as practicable, of the same size as the conduit it extends and with enough slack to reduce the effects of expansion and vibration.

9. Fittings:

a. Connectors shall be malleable iron or steel with insulated throat, squeeze-type, with annular gripping rib. Particular attention shall be given to maintaining ground bond and firm support through flexible connections. Connections shall have insulated throats.

F. Liquid Tight Flexible Conduit:

1. Requirements same as for flexible conduit.
2. Use in areas where environment is damp or could become damp or wet.
3. To contain an equipment grounding conductor with phase conductors. Bond grounding conductor to equipment served and nearest conduit system junction box.
4. Manufacturer: CONTRACTOR option.
5. Usage:

a. Use in conjunction with galvanized rigid metal conduit.
b. Use in conjunction with PVC coated galvanized rigid metal conduit.

6. Conduit:

a. Single strip, helically wound, galvanized steel core inside and outside with smooth interior surface with sunlight resistant thermoplastic jacket suitable for ambient environmental conditions conforming to applicable UL Standards.
b. Jacket shall be positively locked to core to prevent sleeving.
c. All runs of flexible conduit shall be as short as practicable, of the same size as the conduit it extends and with enough slack to reduce the effects of expansion and vibration.

7. Fittings:

a. Where used in conjunction with galvanized rigid metal conduit, connectors shall be malleable iron or steel, electro zinc plated, with insulated throat and taper threaded hub.
b. Where used in conjunction with PVC coated galvanized rigid metal or rigid aluminum conduit connectors shall be malleable iron or steel, electro zinc plated and PVC coated, with insulated throat and taper threaded hub.
c. Particular attention shall be given to maintaining ground bond and firm support through flexible connections.
d. All fittings shall be liquid tight.

G. Nonmetallic Conduit (PVC):

1. Where indicated on drawings.
2. In or under concrete slabs for 3 phase panelboards and 3 phase motor feeders only, NO single phase circuits or networks feeding single phase loads allowed.
3. PVC conduit may be used for low voltage wiring (24 volts or less), where allowed by code. PVC may not be used in plenum rated ceilings or if another type has been called out on the drawings.
4. Where PVC conduit penetrates floor, it must be installed per conduit installation detail.
5. PVC not allowed indoors above slab, except for single ground conductors in non-plenum areas.
6. Manufacturer:

    a. Carlon.
    b. Or equal.

7. Conduit:

    a. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
    b. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-2.
    c. The conduit and fittings shall be homogeneous plastic material free from visible cracks, holes or foreign inclusions. The conduit bore shall be smooth and free of blisters, nicks or other imperfections, which could mar conductors or cables.
    d. Conduit, fittings and cement shall be produced by the same manufacturer to assure system integrity.

8. Conduit Bodies:

    a. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
    b. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-3.
    c. Stainless steel hardware.
    d. Cover constructed of same material with solid gasket.

9. Fittings:

    a. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
    b. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-3.

H. MC Cable (cannot Not Be Used)

2.3 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Intermediate Metal Conduit (IMC): Rigid steel.

C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit all steel fittings.

2.4 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.

B. Fittings: ANSI/NEMA FB 1.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.

B. Fittings: ANSI/NEMA FB 1 with insulated throats.

2.6 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron, insulated throat connectors.

2.7 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.8 SINGLE CHANNEL SURFACE METAL RACEWAYS (WIREMOLD)

A. Description: Sheet metal channel with fitted covers suitable for use as surface metal raceways.

B. Size: As required. Maximum 40% fill.

C. Finish: International white.

D. Fittings: All fittings shall have bend radius controls in accordance with TIA/EIA category 6 standards. Boxes, extension rings. Furnish manufacturer's standard accessories.

2.9 WIREWAYS

A. Description: General purpose type wireway.

B. Knockouts: Bottom only.

C. Size: As required.

D. Cover: Hinged.

E. Connector: Slip-in.

F. Fittings: Lay-in type with removable top, bottom and sides with captive screws.

G. Finish: Rust inhibiting primer coat with gray enamel finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify routing and termination locations of conduit prior to rough in.

B. Verify conduit routing. Routing as shown on Drawings is in approximate locations unless dimensioned. Route as required to complete wiring system.

3.2 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base conduit rough-in or equipment locations on dimensions obtained from the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment and conduit work.

C. Adjust conduit system installation to satisfy field requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Accept conduit on site. Inspect for damage.

C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

D. Protect PVC conduit from sunlight.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. All conduit shall be installed in building unless indicated otherwise.
4. All conduits stubbed into ceiling shall have end bushings.
5. Install conduit in accordance with NECA "Standard of Installation."
6. Install nonmetallic conduit in accordance with manufacturer's instructions.
7. Arrange supports to prevent misalignment during wiring installation.
8. Support conduit using coated steel or malleable iron straps, lay in adjustable hangers, clevis hangers, and split hangers.
9. Group related conduits: support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
10. Fasten conduit supports to building structure and surface under provisions of Section 26 05 29.
11. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
12. Do not attach conduit to ceiling support wires.
13. Arrange conduit to maintain headroom and present neat appearance.
14. Route exposed conduit parallel and perpendicular to walls.
15. Route conduit in and under slab from point to point.
16. Do not cross conduits in slab.
17. Maintain adequate clearance between conduit and piping.
18. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
19. Cut conduit square using saw or pipecutter; de burr cut ends.
20. Bring conduit to shoulder of fittings; fasten securely.
21. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cleaner and cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
22. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
23. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Hydraulic one-shot bender may be used to fabricate factory elbows.
24. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
25. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.
26. Provide suitable pull string in each empty conduit, except sleeves and nipples.
27. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
28. Ground and bond conduit under provisions of Section 26 05 26.
29. Identify conduit under provisions of Section 26 05 53.

30. Flexible metal conduit shall be used for connection to equipment subject to vibration and light fixture drops in all removable tile ceilings. Length shall not exceed 36" for equipment connections and 72" for light fixture connections. Minimum size 1/2", except 3/8" may be used for fixture drops. Install flexible conduit drops from independent junction box mounted above ceiling and accessible from below ceiling to recess ceiling mounted equipment. Allow for positioning of equipment to next tile increment.
31. Seal conduit with oakem or duct seal where they leave heated areas and enter unheated areas.
32. Surface raceway shall be installed to run parallel of all existing surfaces. Where raceway is used on ceiling, raceway shall be mounted at ceiling wall junction and extended from the junction box out to ceiling mounted device. Raceway shall be routed in corners and along mouldings to be as least obtrusive as possible.
33. Exterior cable and conduit installation.

    a. Layout in trench may be started at either end unless the drawings indicate that it is to pitch for drainage. In which case the layout should be started at the lowest end. The cable and conduit shall be pitched 1" per 100 feet.
    b. Include all excavation and backfill.
    c. Cable and conduit shall be a minimum of 30" deep.
    d. Cable and conduit shall be laid in a 6" sand bed and covered with another 6" of sand before backfilling with earth.
    e. Provide Brady identotape 12" above all buried conduits and cables.
    f. Provide #12 pull wire in all empty or spare conduits.
    g. Restore existing surface back to its original condition.
    h. For all excavation, maintain erosion protection per Federal, State, and municipal requirements. All work associated with erosion control for excavation shall be done as per Federal, State and municipal requirements, as well as any plans, meetings, and other special conditions.
    i. For all trenching that is under paved surfaces, backfill with structural material. Material shall be tapped in layers up to the point of the surface paving material.

34. For intermediate floor structural slabs, assume that conduit cannot be installed within the slab. If installing conduit within the slab, coordinate this with the Construction Manager and verify with the Architect prior to installation.
35. For on-grade slabs, the conduit may be run in or under the slab. Verify with concrete installation prior to running conduits in slab to determine if that conduit coordinates with the slab reinforcing.

B. Conduits Stubbed Into Ceiling Space

1. All conduits stubbed into ceiling shall have end bushings or insulated connectors.

C. Exterior Wall Penetrations

1. For all exterior wall penetrations, patch the wall with material to match the existing wall finish. The openings shall be as small as possible to minimize the impact on the existing wall finish. Install duct seal within the conduit to prevent air flow.
2. When conduits are rising from the ground to penetrate the walls, furnish rigid steel conduit where conduit is exposed, and deep-back LB's condulettes or NEMA 4X stainless steel junction box.

D. Interface With Other Products

1. Install conduit to preserve fire resistance rating of partitions and other elements.
2. Route conduit through roof openings for piping and ductwork or through suitable roof jack. Coordinate location with roofing installation.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 34

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SECTION 26 05 35 – ELECTRICAL BOXES

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

B. Conform to current National Electrical Manufactures Association (NEMA) Standards.

C. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

D. Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

1.3 DESCRIPTION OF WORK

A. Furnish and install boxes as indicated on drawings and specified herein.

B. The intent of this section is to limit the use of sheet steel boxes to small circuit wiring in dry locations for installations of outlets, switches, exhaust fans, lights, unit heaters, small overhead door units, small power outlets, and limiting the general circuit capacity of 50 amps or less.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 BOXES

A. Pull boxes and junction boxes: Metal construction, conforming to National Electrical Code, with screw on or hinged cover.

B. Flush mounted pull boxes: Provide overlapping covers with flush head cover retaining screws, prime coated.

C. Small surface type junction boxes to be used in dry locations only for general purpose lighting and outlets shall conform to the following standard sizes and spec's:

1. All boxes and covers shall be made of stamped steel. (No sectional boxes allowed).
2. Minimum sizes:

a.	Handy boxes	4 x 2 1/8 x 2 1/8
b.	Octagon boxes	4 x 1 1/2
c.	4" sq. boxes	4 x 1 1/2 or 4 x 2 1/8
d.	4 11/16" sq. boxes	4 11/16 x 2 1/8

D. Flush mounted outlet boxes used in dry locations shall conform to the following standards:

1. All boxes and covers shall be made of stamped steel. No sectional boxes allowed.
2. All boxes for communications outlets and blank outlets shall be of the "deep" variety.
3. Minimum sizes:

a. Masonry boxes: minimum 3 1/2" deep, gang as required. These can be used for outlets or blank outlets.

b. 4" square wiring device boxes: 2 1/8" deep when used for communication or blank outlets. 1 1/2" or 1 1/8" deep when used for wiring devices. All 4" square boxes shall be equipped with square cut 1" raised covers of appropriate depth.
c. Note special requirements for boxes that will be used in corrosive atmospheres, such as pools. In these atmospheres use corrosion resistant (PVC) outlet boxes.
d. Note special requirements for flush boxes for outside receptacles. These boxes shall be 4-hole type or other type to properly patch the surface weather tight covers.

E. Junction and Splice Boxes:

1. Screw covers, galvanized after fabrication and not less than code dimensions.
2. Entry openings in boxes shall be made with knock-out punch tool or hole saws.
3. Burning of entry openings with a torch will not be acceptable.
4. Paint exposed ferrous surfaces, 2 coats rust resisting paint.

F. Flush interior devices shall utilize 4" square box with raised covers or deep masonry boxes as appropriate.

G. Raised covers to have square cut corners.

H. Where existing boxes are reused, provide add-a-depth device rings to devices installed without proper box depth to finish surface.

I. Box extensions will not be allowed.

J. Through the wall type outlet boxes not allowed.

K. Junction boxes and pull boxes shall not have knockouts. Enclosure type, material, and dimensions shall be as indicated on the drawings and as stated in these specifications. Where no type or size is indicated for junction boxes and pull boxes, they shall be one size larger than required by NEC.

L. For exterior outlets, such as receptacles, use FS type outlet box flush mounted.

M. Large junction boxes shall be constructed from steel in the following gauges:

Box Size	Minimum Steel Gauge
Up to 24" x 30" x 12"	14
24" x 36" x 8" to 36" x 36" x 16"	12
36" x 42" x 8" and larger	11

N. Boxes that are shown on hollow-core, precast concrete shall be flush mounted into the spancrete unless shown otherwise on drawings. Coordinate opening to be in hollow core. Provide opening.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify routing and termination locations of conduit prior to rough in.

3.2 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.

B. Mounting heights:

1. As shown on drawings and details.
2. Coordinate exact heights with specific manufacturer's recommendations.
3. All mounting heights of keypads and pushbuttons to be ADA compliant.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

B. All fire alarm pull and junction boxes and their covers shall be painted red and have "fire alarm" written on the cover in large black non-washable ink. The lettering shall be such that it can be read from 10' away. Note that this requirement is in addition to the NEC requirements which requires that the box itself be marked in red.

C. Boxes that are being installed in rough masonry surfaces (such as split face block) shall be installed in such a manner to allow the wiring device or light fixture and the associated device plate to be seated squarely. Have the masonry opening cut to the size of the plate and then box grouted in, or the rough masonry around the box shall be chiseled away and mortar installed around the box to provide a flat finish.

D. Coordinate with the masonry installation all details of installation on rough masonry surfaces. Without coordination assume responsibility for all costs to provide the flat surface, which will require chiseling the surface of the rough masonry away and providing mortar to obtain this smooth finish.

E. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

F. Install electrical boxes to maintain headroom and to present neat mechanical appearance.

G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

I. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods compatible with NFPA.

J. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices with each other.

K. Use flush mounting outlet boxes in finished areas.

L. Do not install flush mounting boxes back to back in walls; provide minimum 6 inch separation. Provide minimum 24 inches separation in acoustic rated walls.

M. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

N. Use stamped steel bridges to fasten flush mounting outlet box between studs.

O. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

P. Use adjustable steel channel fasteners for hung ceiling outlet box.

Q. Do not fasten boxes to ceiling support wires.

R. Support boxes independently of conduit.

S. Use gang box where more than one device is mounted together. Do not use sectional box.

T. Use 2 gang box with plaster ring for single telecommunication outlets.

U. Use cast outlet box in exterior locations exposed to the weather and wet locations.

V. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.

W. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.

1. Interior Dry Locations: Use hinged enclosure.
2. Other Locations: Use surface mounted cast metal box.

X. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

Y. Interface With Other Products

1. Coordinate masonry cutting to achieve neat opening.
2. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.
3. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 35

SECTION 26 05 36 – CABLE TRAYS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of ANSI/NFPA 70 and 70B.

B. Conform to NEMA VE 2 – 2000 and NEMA VE 1 - 1998 standards.

C. Conform to ASTM B633, A123, A653 and A510 as applicable.

D. Conform to current NEC Standards.

1.3 DESCRIPTION OF WORK

A. Provide and install a complete cable tray system as required on the drawings and as specified herein.

1. Each drop point on the cable tray shall have a radiused drop for those cables that are coming from the cable tray, terminating on wall mounted termination points.
2. D-rings or other type of cable management systems shall be placed on the wall to direct the cables.
3. The cable tray shall be radiused down and be connected to the rack in those areas where the racks are freestanding,
4. Coordinate exact routing location on site and with other trades so tray is accessible and does not interfere with operation of any building systems.
5. Coordinate mounting of supports with general contractor.

B. All necessary equipment required to meet the intent of these specifications, whether or not listed within these specifications, shall be supplied and installed to provide a complete and operational installation.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Indicate tray type, dimensions, support points, and finishes.
2. Provide product data for fittings and accessories.
3. Indicate application conditions and limitations of use stipulated by product testing agency specified under Standards and Requirements.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the items listed above:

1. Indicate all equipment and interconnecting components.
2. Indicate product limitation.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

1.8 WARRANTY

A. Cable tray system shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

2.2 LADDER-TYPE CABLE TRAY

A. General

1. Provide ladder type cable tray of sizes and types indicated with all necessary connector assemblies, clamp assemblies, connector plates, brackets, reducer plates, hangers, grounding straps blind ends, barrier strips and splice bars required for a full and complete installation.
2. Construct units with rounded edges and smooth surfaces for safety of cable and installer.

B. Materials and finishes:

1. Cable tray system shall be made of either a corrosion resistant metal or a metal with a corrosion resistant finish.

C. Standards

1. A complete cable tray system will consist of straight sections, horizontal and vertical bends, “T” connectors, connectors and accessories. All shall be furnished by the same supplier.
2. Ladder Type cable tray shall have minimum 6 inch usable loading depth by 24 inches wide.
3. Straight sections shall be a minimum of 12 feet long.
4. Cross members (rungs) shall be 6 inches on center with clear opening of 5 inches.
5. Cross members shall be assembled to the side channels by arc welding to insure integrity of fault ground path for the life of the system. Non-welded joining of rungs to side channel shall not be permitted.
6. Design shall be such that all like parts are interchangeable and that trays may be readily assembled and joined without the use of special tools.
7. The inside of the cable tray system shall present no sharp edges, burrs, or projections which can damage cable insulation.
8. Load bearing capability of the system shall be 100 pounds per foot safe uniform loading on a 6 foot space with NEMA factor of safety of 1.5 (working load category C) when tested in accordance with NEMA VE-1-1998 Section 4.
9. Fittings shall have a bend radius of 12 inches. Rung spacing of 9 inches on centers shall be maintained at the center line of the bend radius. Metal thickness of fittings shall be equal to straight sections.
10. Connectors shall be high pressure rigid type attached by ribbed neck, cyanide hardened, steel screws and free spinning (lock type) nut which does not need a washer. Hardware finish shall be cadmium plated with yellow iridite dip. Ribbed neck portion of screw shall prevent screw from rotating during tightening of nut.
11. Supports shall be a maximum of 12 feet. Support shall be single member from center line of tray to facilitate laying in cable from either side of tray.

2.3 WARNING SIGNS

A. Engraved Nameplates: 1/2 inch high black letters on yellow laminated plastic nameplate, engraved with the following wording:

WARNING! DO NOT USE CABLE TRAY AS WALKWAY, LADDER, OR SUPPORT.
USE ONLY AS MECHANICAL SUPPORT FOR CABLES AND TUBING!

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Inspect final installation for damage.

3.2 FIELD MEASUREMENTS

A. Field verify all measurements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer’s recommendations.
2. Install in accordance with manufacturer's instructions following recognized industry practices outlined in NEMA VE-2.
3. Install metallic tray in accordance with detail, provide single point mounting.
4. Support trays in accordance with manufacturer’s requirements.
5. Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports of 6 feet maximum.
6. Use single point support for double tray. Use two supports or "T" support for single tray. NO TRAPEZE SUPPORTS.
7. Use expansion connectors where required.
8. Ground and bond cable tray under provisions of Section 26 05 26.
9. Provide continuity between tray components.
10. Use anti-oxidant compound to prepare aluminum contact surfaces before assembly.
11. Bond each isolated component with #2 AWG equipment grounding conductor.
12. Connections to tray may be made using mechanical or exothermic connectors.
13. Install warning signs at 50 feet centers along cable tray, located to be visible.
14. Provide all mounting hardware required for a complete installation.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 36

SECTION 26 05 37 – LOCATION OF OUTLETS AND EQUIPMENT

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

B. Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete installation as indicated on the drawings and as specified herein.

B. This specification lays out the general requirements for heights of devices. Heights of devices may be required to be changed depending on interferences in the walls or interferences with mechanical or other architectural equipment. Assume responsibility for verifying the existing conditions in the room by reviewing mechanical and architectural drawings so as not to interfere with that equipment.

C. Verification of door swings. Assume responsibility to verify door swings with the architectural plans prior to outlet box installation. Review if the switch location is such that it can be easily accessed upon opening the door.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS (NONE)

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts are to be new, undamaged and unused of current manufacture.

C. All boxes to be plumb and level.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 EQUIPMENT

A. Specifications for equipment being installed under conditions set forth in this section shall be found in related work elsewhere.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify installation locations suitability and adjust as directed.

3.2 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.

B. Mounting heights:

1. As shown on drawings and details.
2. Coordinate exact heights with specific manufacturer’s recommendations.
3. All mounting heights of keypads and pushbuttons to be ADA compliant.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section prior to installation.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

B. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

C. Location:

1. Location of outlets and equipment as shown on plans is approximate. Verify exact location determined by:

   a. Construction or code requirements.
   b. Conflict with equipment of other trades.
   c. Equipment manufacturer's drawings.

2. Minor modification to the location of outlets and equipment is considered a part of this specification and shall be made with no additional compensation.
3. Mounting heights for all devices and equipment to be measured from finished floor to center of device and unless otherwise noted on plans shall be as follows:

Switches	42"	
Receptacles	18"	
Above Counter receptacles	-	mount just above backsplash for above counter outlets. See floor plan general notes.
Communication outlets	-	to match adjacent receptacle outlet. If receptacle outlet is not shown, provide 22" above floor to center of device or 8" above counter.
Wall Telephone	42"	
Fire Alarm Horn/Strobe Signal	82"	above the floor (shall be to the highest point in the space i.e. above highest riser level) or 6" below ceiling (whichever is lower)
Fire Alarm Pull Station	42"	

Fire Alarm Strobe	82"	above the floor (shall be to the highest point in the space i.e. above highest riser level) or 6” below ceiling (whichever is lower)
Blank Outlets	-	to match receptacle height located adjacent to it unless stated otherwise on plans

D. Check Heating and Ventilating Plans for location of baseboard heating elements or wall radiators and mount equipment accordingly.

E. Receptacles below counter: Verify the actual mounting height with architect. Determine if device is to fit into knee space and rough-in accordingly.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 37

SECTION 26 05 53 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

B. Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

1.3 DESCRIPTION OF WORK

A. Furnish and install complete labeling as specified herein.

B. All major pieces of electrical equipment shall have engraved labels indicating their functions. This shall include the following:

1. Provide engraved tags for all air handling units, including HVAC units. Each unit shall be adequately marked with a tag indicating what unit number it is. An engraved tag shall also be provided on all air handling units which have smoke detector shut down. This tag shall indicate the following: "This air handler is equipped with smoke detector shut down. In the event that smoke is sensed in the ductwork, the air handler will turn off".
2. All panelboards, starters, disconnects and switches shall have engraved labels indicating their functions.
3. Provide engraved tags for all special pull and junction boxes that are associated with the building special systems.
4. Provide engraved tags for all systems keys.
5. Provide all spare keys and tags as indicated for keyed switches.

C. Low Voltage Systems

1. Provide labeling for all low voltage cabling, both ends within 3” of termination point and low voltage device plates. Color coding to be maintained for each system independently.
2. Each component of the system to be clearly marked as to manufacturer, part number, and any special designation on drawing.
3. All patchpanels, racks, and modular plates in patchpanels to be labeled.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATIONS & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts are to be new, undamaged and unused of current Manufacturer.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 ENGRAVED LABELS

A. Where the words "provide engraved label" appears on the drawings or in the specifications, it shall mean that the label shall be an engraved 3-layer phenolic label with black letters on white material, unless other colors are called out on the drawings or details.

B. The label size shall be a minimum of 3/4" high and be 3" long. Labels may be attached with double backed adhesive tape unless indicated otherwise.

C. Where references are made on the drawings to provide engraved labels, engraved nameplate or engraved plates, these should be engraved phenolic labels.

2.3 ENGRAVED PLATES

A. Where references are made to engraved plates, this shall mean that the normal device plate shall have an engraving on it with black letters so as to indicate what this switch or device is used for.

2.4 BRANCH CIRCUIT OUTLETS: LABELING

A. Each branch circuit outlet, receptacles, lighting, and any other device requiring 120/208 volt power, the contractor shall:

1. Provide circuit, written in pencil or non-washable ink, inside of outlet box in an area that can be easily viewed when removing outlet faceplate.
2. Write circuit number in ink on device between receptacles under plate.
3. Optional: Provide typed label (not dyno label) for each circuit attached to device plate.
4. Label each junction box outlet cover in non-washable marker as to circuit number routed through junction box.

2.5 PANELBOARDS: LABELING

A. Panelboard Directory:

1. Prepare and affix a typewritten directory to the inside cover of each panelboard indicating loads controlled by each circuit.
2. Each distribution and lighting panelboard shall be equipped with a typewritten directory accurately indicating rooms and/or equipment being served.
3. Assume that originally directories will have to be developed based on the room numbers on the project drawings.
4. Near project completion, all directories will have to be changed to reflect actual room numbers as designated by the building occupant.
5. Include the cost of doing the original handwritten directory and revisions to the directory based on occupant room numbers.
6. Each existing panelboard that is revised, modified or has had circuits deleted or added to, shall have its directories retyped to reflect existing circuits and all modified circuits.
7. Each changed circuit on existing panelboards shall have an asterisk next to the revised or modified circuits.

B. Panelboard Identification:

1. Label per NEC 210.5.
2. Identify each panel with a suitably engraved nameplate mounted at the top of the front cover.
3. The nameplates shall be made of laminated black and white plastic with white on the outside.
4. The lettering shall be 1/4 inch high (minimum), engraved by cutting through the white outside layer so that the letters appear black.
5. Fasten nameplates with brass or stainless steel panhead screws.
6. Nameplate engraving shall match the numbers or letters shown on the drawings or assigned by the Owner's Representative.

7. Labels shall be engraved as to the function of the circuit breaker.
8. Labels shall also be engraved to indicate the load served by the circuit breaker.

C. Identify the source of the feeder circuit serving the panelboard.

2.6 POWER DISTRIBUTION PANELS

A. Each power panel that does not have a front hingeable door shall have an engraved laminated label attached adjacent to each circuit breaker.

B. The label shall be engraved as to the function of that circuit breaker and the load served by that circuit breaker.

C. For connections to existing switchboards in panel, provide engraved label for new circuit breaker and provide engraved labels for those circuit breakers that are modified.

2.7 STARTERS, DISCONNECTS AND VFD'S

A. Each starter, disconnect, and VFD furnished by this section or furnished by other sections but installed by this section shall have an engraved laminated label indicating which piece of equipment it controls.

B. This requirement is waived if the disconnect or starter is attached directly to the piece of equipment that it is controlling or operating.

2.8 FIRE ALARM SYSTEM

A. Each new fire alarm system junction and pull boxes and covers shall be identified by having it marked with red paint. Additional identification shall be included as follows:

1. The flat cover shall also be painted red with the words "Fire Alarm" clearly indicated on it.
2. The letters shall be a minimum of 1 1/2" high.
3. Handwritten letters may be used above ceilings or where otherwise concealed, stenciled covers shall be used where exposed, such as closets, mechanical rooms, etc.
4. This marking is in addition to the NEC required marking.

2.9 TERMINAL AND PULL BOXES

A. Those devices as indicated as terminal boxes, junction, or pull points that have internal terminal strips. Each terminal box shall:

1. Be identified on the outside of its cover as to its function.
2. Have an engraved laminated label attached to the outside of its cover which identifies its function.
3. Have terminal strips permanently marked with a numbering system that corresponds to the drawings furnished for the system.

4. Have each wire terminating on the terminal strip identified as to its wire number which is identified on the wiring diagram for this system.

B. Refer to wire marker, this section, as to the type of wire number required.

2.10 COMMUNICATIONS SYSTEM CABLES IDENTIFICATION

A. Communication system cables are defined as:

1. All low voltage cabling, not 120 volt.

B. Each wire or cable that is furnished and installed for the above systems shall be identified at each end of the cable using the same identification marker at both ends, within 3” of termination point.

C. The identification shall be the same that is furnished by the contractor in his submittal documents.

D. Labels shall be overwrap type “Panduit PLL or PDL type” or equal labels by Brady.

2.11 COMMUNICATIONS SYSTEM DEVICES

A. Communication system devices are designated as:

1. Data outlets in rooms.
2. Data outlets at patchpanel.

B. Each label shall be a computer generated, laser printed, adhesive type label; either clear or white.

C. The labels shall be attached to each of the plates so that the device on the plate can be easily identified.

D. Provide Panduit PLL series type label, or equal by Brady.

2.12 MISCELLANEOUS

A. Branch circuits

1. On branch circuits, use shall be made of all standard wire insulation colors available.
2. Where wires of different systems junction in a common box, each cable shall be grouped with its own system and identified using tags or identification strips.

B. Special systems

1. All control, instrumentation, graphic display, alarm and other special system wires shall be clearly identified by description and location, using tags or identification strips.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces are cleaned and ready to receive labels.

B. Verify labels are correct.

C. Verify that labels are installed as specified, level and plumb.

3.2 FIELD MEASUREMENTS (NONE)

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

3.4 INSTALLATION

A. General:

1. Degrease and clean surface prior to installing labels.
2. Install nameplate and label parallel to equipment lines.
3. Secure nameplates to equipment fronts using screws, if so, specified on drawings.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 53

SECTION 26 05 73 – ELECTRICAL SYSTEMS ANALYSIS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work under this Section.

1.2 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.

1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

a. NFPA 70 - National Electrical Code.
b. NFPA 70E - Standard for Electrical Safety in the Workplace

2. Institute of Electrical and Electronics Engineers (IEEE), Specifications and Standards, current edition:

a. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
b. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings
c. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
d. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis
e. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
f. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations

1.3 DESCRIPTION OF WORK

A. Provide this study prior to ordering the distribution equipment so necessary change in distribution equipment can be made.

B. Furnish short-circuit and protective device coordination studies for the entire electrical distribution system.

C. Furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current issue of NFPA 70E -Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 - 2002, the IEEE Guide for Performing Arc-Flash Calculations.

D. The electrical power system studies shall encompass the following electrical equipment located at the Greenfield Middle School:

1. All distribution panelboards, lighting and appliance panelboards, generators, and automatic transfer switches shown on the one-line diagram

1.4 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Preliminary short-circuit and protective device coordination studies shall be submitted and approved prior to the approval of any electrical equipment submittals that may be affected by the results of the study.

C. Final short-circuit, protective device coordination, and arc flash hazard analysis studies shall be prepared and submitted based upon actual installed system characteristics.

D. Submit the following information specifically for Electrical Systems Analysis:

1. The results of the short-circuit, protective device coordination, and arc flash hazard analysis studies shall be summarized in a final report. A minimum of five (5) bound copies of the complete final report shall be submitted. Electronic PDF copies of the report shall be provided.
2. The report shall include the following sections:

a. Executive Summary including Introduction, Scope of Work and Results/Recommendations.
b. Short-Circuit Methodology Analysis Results and Recommendations
c. Short-Circuit Device Evaluation Table
d. Protective Device Coordination Methodology Analysis Results and Recommendations
e. Protective Device Settings Table
f. Time-Current Coordination Graphs and Recommendations
g. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
h. Arc Flash Labeling section showing types of labels to be provided. Section shall contain descriptive information as well as typical label images.
i. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

3. Submit an electronic version of the software model used to prepare the final short-circuit, protective device coordination, and arc flash hazard analysis studies.

1.5 QUALITY ASSURANCE

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall be an employee of the approved engineering firm.

C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

D. The approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analyses it has performed.

E. The studies shall be performed using SKM Systems Analysis Power*Tools for Windows (PTW) software program or an approved equivalent software tool.

PART 2 - PRODUCTS

2.1 DATA COLLECTION

A. Field data collection shall be performed by a technician, qualified (as defined by NFPA 70E - 2004) to ensure accurate equipment modeling. The technician shall have completed an 8-hour instructor-led Electrical Safety Training Course. The course shall include NFPA 70E training which includes the selection and use of personal protective equipment.

B. The technician shall visually inspect to verify the equipment ratings, conductor ratings and overcurrent device data by removing panels, covers and doors where required to document the necessary data used in the analysis. The technician shall be qualified to perform these inspections with the equipment energized provided the incident energy values are less than 40cal/cm², greater values or unusual site conditions will require an equipment shutdown so the equipment can be inspected de-energized.

C. The Owner or Contractor shall provide qualified personnel to show the technician the equipment locations and to open all equipment doors, locks, etc. necessary to collect nameplate data.

D. Verify one-line drawings and provide marked corrections where discrepancies are found..

E. Data collection shall begin downstream from the utility service and continue down through the electrical distribution system as defined under scope of work. The study shall not include any single phase AC circuits or DC distribution systems as these types of circuits and systems are excluded from IEEE 1584-2002 Arc Flash calculation guidelines. The study need not include equipment rated 240 volts or less per NFPA 70E, when supplied by a single transformer rated less than 125kVA.

F. Obtain from the utility the minimum, normal, and maximum operating service voltage levels, three-phase short circuit MVA and X/R ratio, as well as line-to-ground short circuit MVA and X/R ratio at the point of connection as shown on the drawings.

2.2 SHORT-CIRCUIT ANALYSIS

A. Transformer design impedances shall be used when test impedances are not available.

B. Provide the following:

1. Calculation methods and assumptions
2. Selected base per unit quantities
3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis
4. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
5. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
6. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.

D. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short circuit ratings
2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses
3. Identify in writing, any circuit protective devices improperly rated for the calculated available fault current.

2.3 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B. Include on each TCC graph, a complete title with descriptive device names.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:

1. Electric utility's overcurrent protective device
2. Medium voltage equipment overcurrent relays
3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
6. Medium voltage conductor damage curves
7. Ground fault protective devices, as applicable
8. Pertinent motor starting characteristics and motor damage points, where applicable
9. Pertinent generator short-circuit decrement curve and generator damage point
10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Provide the following:

1. A one-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram

5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
6. Identify in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.4 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis and the protective device time-current coordination analysis.

B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

C. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.

D. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.

E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations

F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

G. The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

H. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 5 cycles.

I. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.

J. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

K. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

L. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

M. Provide the following:

1. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.

a. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.

1) The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.

PART 3 - CONSTRUCTION METHODS

3.1 FIELD ADJUSTMENT

A. The Contractor or equipment manufacturer's start-up technician shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

B. The Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

C. Square D shall notify Owner in writing of any required major equipment modifications.

3.2 ARC FLASH LABELS

A. Provide a 4.0 in. x 4.0 in. thermal transfer type label of high adhesion polyester for each work location analyzed.

B. The labels shall be designed according to the following standards:

1. UL969 - Standard for Marking and Labeling Systems
2. ANSI Z535.4 - Product Safety Signs and Labels
3. NFPA 70 (National Electric Code) - Article 110.16

C. The label shall include the following information:

1. System Voltage

a. Flash protection boundary
b. Personal Protective Equipment category
c. Arc Flash Incident energy value (cal/cm²)
d. Limited, restricted, and prohibited Approach Boundaries

1) Study report number and issue date

D. Labels shall be printed by a thermal transfer type printer, with no field markings.

E. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:

1. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.
2. Wall Mounted Equipment - Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
3. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

F. Label Installation

1. Labels shall be field installed by the Contractor. The technician providing the installation shall have completed an 8-Hour instructor led Electrical Safety Training Course with includes NFPA 70E material including the selection of personal protective equipment.

END OF SECTION 26 05 73

SECTION 26 09 23 – LIGHTING CONTROLS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 National Electrical Code.

B. Conform to current National Electrical Manufactures Association (NEMA) Standards.

C. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

D. Conform to current NEMA Enclosure Standards.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete lighting control system as shown on the drawings and as specified herein. This equipment shall provide the following functions:

1. Dual technology, PIR and ultrasonic motion sensor lighting controls.
2. Photo sensors

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Submittal drawings are required for the following systems. They shall include the following:

a. Dual technology, Passive infrared and ultrasonic lighting controls.

1) Drawing showing all switches, and sensors and connections between all devices and lighting circuits.

2) Cut sheets on components.
3) Proper circuit numbers shall be shown on drawings.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts shall be new and unused of current manufacture.

C. Provide all necessary accessories required for a complete and operable system.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

PART 2 - PRODUCTS

2.1 NON DIGITAL LIGHTING CONTROL DEVICES

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Furnish and install complete lighting control system as specified in these specifications and on the drawings. Exact quantities and equipment configurations to be determined by plans, specifications, control schedules, and as required by manufacturer to make a complete and operating system.

2.2 DUAL TECHNOLOGY CEILING MOUNTED LIGHTING CONTROL

A. Provide dual technology type lighting controls in all areas unless directed to use single technology ultrasonic or passive infrared technology.

B. Determine proper sensor type and relay for direct connection requirements. Provide appropriate units.

C. Employ the services of a manufacturer's appointed representative to assist in making the proper adjustments on the motion detector installation. Meet with this person prior to making installation to determine if the locations shown are appropriate for the type of device being furnished. Make modifications in the locations for the devices, if required, to provide a more adequate installation.

D. Modify time settings, sensitivity settings, and "initial on" and "keep on" controls as necessary, and as required for the space. Default time of 15 minutes "keep on" time will be used at initial activation.

E. Installation assistance:

1. Include time in bid to work with the Owner and manufacturer to determine the proper time setting and sensor setting for each of the motion switches.
2. Each of the switches shall be set for the type of space in which they operate.
3. Include time in bid to have the manufacturer's representative come on site and review the job to determine what the expected settings are for the equipment.

F. Zero crossing relay controls shall be supplied.

G. Dual technology occupancy sensors shall be capable of detecting presence in the floor area by detecting doppler shifts in transmitted ultrasound and passive infrared heat changes.

H. Ultrasonic sensing shall be volumetric in coverage.

I. Passive infrared sensing shall utilize a multi-element fresnel lens to ensure that the sensor is insensitive to short-wavelength infrared waves such as those emitted by the sun. Lens shall have grooves facing in to avoid dust and residue build up which affect ir reception.

J. Both technologies shall sense presence in floor area before lighting will turn on. Detection by either technology shall hold lighting on for set period of time.

K. Sensors shall have time-out adjustment from 15 seconds to 35 minutes. Sensor shall not have settings exceeding 35minutes.

L. Sensors shall cover 2000 square feet with standard lens and 90 linear feet with long-range lens for walking motion in corridors. Coverage meeting NEMA Standard WD 7-2000 will be required.

M. Sensors shall be capable of being networked to achieve adequate coverage.

N. Sensors shall have an isolated relay rated at 24VDC that can be used to interface with HVAC, EMS, and other monitoring systems.

O. Each sensing technology shall have independent sensitivity adjustments, time adjustments and led display.

P. Sensitivity and timer control shall be accessible on the front of the sensor. Sensor shall incorporate an accessible, but recessed on/override device.

Q. Sensors shall operate on 24VDC.

R. Power supply shall be provided by a power pack that consists of a transformer and contact relay in one unit.

S. Provide 18 gauge plenum rated cable for interconnection of centers to relays.

T. Sensor shall have standard 5 year warranty and shall be UL listed.

U. Approved venders are Watt Stopper or equal

2.3 ULTRASONIC CEILING MOUNTED LIGHTING CONTROL

A. Where so indicated, provide an ultrasonic lighting control.

B. Provide second contact in all sensors to accommodate HVAC interface.

C. Determine proper sensor type and relay for direct connection requirements. Provide appropriate units.

D. Employ the services of a manufacturer’s appointed representative to assist in making the proper adjustments on the motion detector installation. Meet with this person prior to making installation to determine if the locations shown are appropriate for the type of device being furnished. Make modifications in the locations for the devices, if required, to provide a more adequate installation.

E. Modify time settings, sensitivity settings, and "initial on" and "keep on" controls as necessary, and as required for the space. Default time of 15 minutes “keep on” time will be used at initial activation.

F. Installation assistance:

1. Include time in bid to work with the Owner and manufacturer to determine the proper time setting and sensor setting for each of the motion switches.
2. Each of the switches shall be set for the type of space in which they operate.
3. Include time in bid to have the manufacturer’s representative come on site and review the job to determine what the expected settings are for the equipment.

G. Zero crossing relay controls shall be supplied.

H. Ultrasonic sensing shall be volumetric in coverage.

I. Ultrasonic occupancy sensors shall be capable of detecting presence in the floor area by detecting doppler shifts in transmitted ultrasound.

J. Sensors shall have time-out adjustment from 15 seconds to 35 minutes. Sensor shall not have settings exceeding 35minutes.

K. Sensors shall cover 2000 square feet with standard lens and 90 linear feet with long-range lens for walking motion. Coverage meeting NEMA Standard WD 7-2000 will be required.

L. Sensors shall be capable of being networked to achieve adequate coverage.

M. Sensors shall have an isolated relay rated at 24VDC that can be used to interface with HVAC, EMS, and other monitoring systems.

N. Sensors shall have adjustable ultrasonic sensitivity sensor shall have independent sensitivity adjustments, time adjustments and led display.

O. Sensitivity and timer control shall be accessible on the front of the sensor. Sensor shall incorporate an accessible, but recessed on/override device.

P. Sensors shall operate on 24VDC.

Q. Power supply shall be provided by a power pack that consists of a transformer and contact relay in one unit.

R. Provide 18 gauge plenum rated cable for interconnection of centers to relays

S. Sensor shall have standard 5 year warranty and shall be UL and CUL listed.

T. Approved venders are Watt Stopper or equal.

2.4 AUTOMATIC PASSIVE INFRARED WALL SWITCH LIGHTING CONTROL

A. Where so indicated, provide a passive infrared wall switch lighting control.

B. Determine proper sensor type and relay for direct connection requirements. Provide appropriate units.

C. Employ the services of a manufacturer’s appointed representative to assist in making the proper adjustments on the motion detector installation. Meet with this person prior to making installation to determine if the locations shown are appropriate for the type of device being furnished. Make modifications in the locations for the devices, if required, to provide a more adequate installation.

D. Modify time settings, sensitivity settings, and "initial on" and "keep on" controls as necessary, and as required for the space. Default time of 15 minutes “keep on” time will be used at initial activation.

E. Installation assistance:

1. Include time in bid to work with the Owner and manufacturer to determine the proper time setting and sensor setting for each of the motion switches.
2. Each of the switches shall be set for the type of space in which they operate.
3. Include time in bid to have the manufacturer's representative come on site and review the job to determine what the expected settings are for the equipment.

F. Confirm compatibility with all ballasts and fans used in conjunction with passive infrared wall switch.

G. Zero crossing relay controls shall be supplied.

H. Switch shall have processing capabilities designed to prevent false offs and false triggers.

I. Single relay and dual relay models shall be available. Dual relay models shall provide zero crossing relay controls only on the primary relay.

J. Load range 25 to 600 watts at 120 volts and 60 to 1200 watts at 277 volts.

K. Coverage area shall be 300 Sq. Ft.

L. Switch shall have integral light level sensor.

M. Use this option only in daylight harvesting application.

N. Switch shall have option of auto on/off or manual on/auto off operation.

O. Switch shall have led passive infrared sensing indicator.

P. Timer to be set for 15 minutes and switch to be set in manual on/auto off mode at turn on.

Q. Approved venders are Watt Stopper, Hubbell, Novitas, Leviton, or Sensor Switch.

2.5 TIMECLOCK

A. 7 day, LED compatible, electronic

2.6 EXAMINATION

A. Verify equipment is in compliance with approved submittal drawings.

2.7 FIELD MEASUREMENTS (NONE)

2.8 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

2.9 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Install products in accordance with manufacturer's instructions.

D. Install devices plumb and level.

E. Install switches with off position down.

F. Labeling:

1. Each panel enclosure shall be labeled as to its function.
2. Each bypass switch and bypass relay shall have engraved labels indicating their functions.

G. Installation:

1. Utilize plenum rated Cat 5e cabling (green) to connect devices on Digital dimming system local network.
2. Provide pre terminated cat 5 cabling, length as required.
3. Install the work of this section in accordance with manufacturer's printed instructions unless otherwise indicated.

H. Programming:

1. Calibrate settings for time delay, sensitivity, fade rates, etc. to guarantee proper detection of occupants and energy savings. Adjust time delay so that controlled area remains lighted for 5 minutes after occupant leaves area.
2. Set sensor and switching zones as required for application.

3. Set time switch settings as required for application.
4. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:

    a. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
    b. Sequence of operation (e.g. manual ON, Auto OFF, etc.)

5. After 30 days of occupancy, re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

I. Factory Services:

1. Upon completion of the installation, the manufacturer's factory authorized representative shall start up and verify a complete fully functional system.
2. The contractor shall provide both the manufacturer and the electrical engineer with 3 weeks written notice of the system start up and adjustment date.
3. Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the Owner's personnel on the adjustment and maintenance of the system.

2.10 OWNER TRAINING

A. Provide complete operator training for the Owner's personnel.

END OF SECTION 26 09 23

SECTION 26 24 16 – PANELBOARDS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

1. NFPA70 – National Electrical Code.

B. National Electrical Contractors Association (NECA), Standard of Installation, current edition.

C. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.

1. NEMA PB 1 - Panelboards
2. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
3. NEMA AB 1 - Molded Case Circuit Breakers.

D. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:

1. UL 50 - Enclosures for Electrical Equipment
2. UL 67 - Panelboards.
3. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures

E. Canadian Standards Association (CSA), Specifications and Standards, current edition:

1. CSA Standard C22.2 No. 29-M1989 - Panelboards and Enclosed Panelboards
2. CSA Standard C22.2 No. 5-M91 - Molded Case Circuit Breakers

F. Federal Specifications and standards, current edition:

1. W-P-115C - Type I Class 1
2. W-C-375B - Molded Case Circuit Breakers
3. W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit and Service.
4. W-P115C - Type 1 Class 2 Load Center

G. American Society of Testing Materials (ASTM), Specifications and Standards, current edition.

1.3 DESCRIPTION OF WORK

A. Furnish and install complete and operable Distribution and Branch Circuit Panelboards system as indicated on the drawings and as specified herein.

B. Under Base Bid provide all panels with copper bussing including ground bar.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the above:

1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.
2. Overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. Illustrate one line diagrams with applicable voltage systems.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. The panelboard manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

C. All panelboards provided under this section shall be the products of a single manufacturer specializing in manufacture of panelboard products with a minimum of fifty years documented experience.

D. Provide all necessary accessories required for a complete and operable system.

1.8 WARRANTY

A. Panelboards shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Provide a complete and fully functional distribution system using materials and equipment of types, sizes, and rating as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.

2.2 240VAC LIGHTING AND APPLIANCE PANELBOARDS

A. Manufacturers

1. Base bid: Square D Company NQ
2. Voluntary alternate bid: Cutler-Hammer

B. Interior:

1. Rated for 240 vac/48 VDC maximum. Continuous main current ratings, as indicated on the drawings, not to exceed 600 amperes maximum.
2. UL Listed short circuit current ratings as indicated on the drawings with a maximum of 200,000 RMS symmetrical amperes.
3. Provide one continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing shall be copper. Bus bar plating shall run the entire length of the bus bar. Main lug and main breaker panelboards shall be suitable for use as Service Equipment.
4. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
5. A solidly bonded copper equipment ground bar shall be provided. An additional copper isolated/insulated ground bar shall also be provided where indicated on the drawings.
6. Split solid neutral shall be plated and located in the mains compartment up to 225 amperes so all incoming neutral cable may be of the same length. UL Listed panelboards with 200 percent rated solid neutrals shall have copper neutral bus for non-linear load applications where indicated on the drawings.

7. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twist-outs covering unused mounting space.
8. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.
9. Interiors shall be field convertible for top or bottom incoming feed. Main circuit breakers shall be vertically mounted. Sub-feed circuit breakers shall be vertically mounted. Interior leveling provisions shall be provided for flush mounted applications.

C. Main Circuit Breaker:

1. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40 degrees C ambient environment. Thermal elements shall be ambient compensating above 40 degrees C.
2. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.
3. Circuit breaker handle and faceplate shall indicate rated ampacity. Circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.
4. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position where indicated on the drawings.
5. Lugs shall be UL Listed to accept solid or stranded copper conductors. Lugs shall be suitable for 75 degree C rated wire or 90 degree C rated wire as required by the application. Lug body shall be bolted in place; snap-in designs are not acceptable.
6. The circuit breakers shall be UL Listed for use with and provided with the following accessories where indicated on the drawings: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.

D. Branch Circuit Breakers:

1. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the drawings.
2. Molded case branch circuit breakers shall have bolt-on type bus connectors.
3. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.
4. There shall be two forms of visible trip indication. The breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red indicator appearing in the clear window of the circuit breaker housing.

5. The exposed faceplates of all branch circuit breakers shall be flush with one another.
6. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 75 degree C rated wire or 90 degree C rated wire as required by the application.
7. Breakers shall be UL Listed for use with the following accessories where indicated on the drawings: Shunt Trip, Auxiliary Switch, and Alarm Switch.

E. Enclosures:

1. Type 1:

a. Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvannealed steel will not be acceptable.
b. Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
c. Box width shall be 26-inch wide maximum.
d. Type 1 Fronts:

1) Front shall meet strength and rigidity requirements per UL 50 standards. Front shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
2) Fronts shall be hinged 1-piece with door. Mounting shall be flush or surface as indicated on the drawings.
3) Panelboards shall have fronts with concealed door hinges and mounted with trim screws. Front shall not be removable with the door locked. Doors on front shall have rounded corners and edges shall be free of burrs.
4) Front shall have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of door.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify equipment is in compliance with approved submittal drawings.

B. Examine area to receive panelboard to assure adequate clearance for panelboard installation.

C. Start work only after unsatisfactory conditions are corrected.

D. Inspect completed installation for physical damage, anchorage, and grounding.

E. Perform tests according to panelboard manufacturer’s instructions.

F. Tighten bus connections and mechanical fasteners.

G. Touch-up scratched or marred surfaces to match original finish.

3.2 FIELD MEASUREMENTS

A. Field verify locations of panelboards with other trades. Adjust as required to meet field conditions and code requirements. Do not base exact panelboard locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Adjust panelboard installation to satisfy field requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Do not store exposed to weather.

C. Physically protect against damage from work of other trades.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

D. Install panelboards so that circuit breakers are not more than 6 feet above the finished floor or grade.

E. Where panelboards or auxiliary cabinets are flush mounted in an outside wall, insulate the enclosure back and sides with 1/2 inch rigid fiberglass insulation and vapor barrier.

F. Selectively connect branch circuits to equally balance currents in the panelboard busses.

G. See Section 26 05 29 for equipment mounting.

H. Install panelboards plumb and flush with wall finishes.

I. Install panelboards such that top of panel is located at an elevation of 6-feet above finished floor elevation.

J. Provide filler plates for unused spaces in panelboards.

K. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads. See Section 26 05 53.

L. Stub five empty 1-inch conduits to accessible location above ceiling and additional five empty 1-inch conduits below floor (if space exists) of each flush-mounted panelboard to allow for future expansion.

M. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 10 percent, rearrange circuits in the panelboard to balance the phase loads within 10 percent. Take care to maintain proper phasing for multi wire branch circuits.

N. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

O. Verify that bonding jumper is properly installed in service entrance rated panels.

P. Thoroughly clean and remove construction debris from panelboard interior and exterior.

3.5 OWNER TRAINING

A. Provide complete operator training for the Owner’s personnel.

B. Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

3.6 SPARE EQUIPMENT

A. As shown on panel schedules.

B. All spare breakers listed on panel schedules to be mounted in panelboards.

END OF SECTION 26 24 16

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SECTION 26 27 02 – MOTOR WIRING

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

B. Conform to current National Electrical Manufactures Association (NEMA) Standards.

C. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

D. Conform to National Electrical Contractors Association (NECA) “Standards of Installation”.

1.3 DESCRIPTION OF WORK

A. Furnish and install complete connections and wiring to motors as indicated on the drawings and as specified herein.

B. Check the drawings and specifications of all other divisions of work for equipment and work which must be included whether or not shown on the electrical drawings, in order to provide a complete electrical installation.

C. Install all motor starters and variable frequency drives.

D. Coordinate motor installation with other divisions of work.

E. Furnish overload devices for motor starters.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

1.8 WARRANTY

A. Installation shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 NOT USED

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that equipment is in compliance with approved submittal drawings.

3.2 FIELD MEASUREMENTS (NONE)

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

B. Motor starters shall be furnished by the division of work supplying the motor requiring a starter except where specifically stated otherwise on the electrical drawings.

C. Check the drawings and specifications of the other divisions to determine the requirements for motor disconnect switches and disconnects furnished by other divisions.

1. Install all required disconnect switches.
2. Provide all code required disconnect switches not specifically supplied by others.

D. Unless otherwise indicated on the drawings or elsewhere in these specifications, all motors shall be furnished by others.

E. Motors shall be set in place by others and the associated motor starters, controllers, and disconnects shall be turned over for installation.

F. Control wiring, regardless of voltage, shall be the responsibility of the division providing the motor unless specifically indicated otherwise on the electrical drawings.

G. Furnish and size the overload protection as required for the motor load.

1. Thoroughly investigate the equipment connection schedules and other portions of the contract drawings to determine the extent of work required for connections to equipment furnished by others.

H. The National Electric code requires that a duplex receptacle be installed on the roof anytime there is roof mounted equipment installed:

1. Provide a heavy-duty weatherproof ground fault receptacle on the roof near the roof mounted air conditioning, refrigeration, and heating equipment.
2. The outlet box shall be an FS cast iron type.
3. This receptacle may be attached to an equipment supporting leg or other similar apparatus on the roof, or if none is available, shall be supported using a supporting framework.
4. The receptacle feed conduits shall be stubbed through the roof using a weatherproof boot.
5. This receptacle shall be connected to the nearest available panel and connected to a 20 amp circuit breaker unless shown otherwise on plans.
6. This receptacle shall be furnished whether or not it is explicitly shown on the drawings.

I. Final Testing:

1. Prior to energizing any equipment whether installed by this section or not:
2. First make a thorough inspection of it to make sure it has been unpacked correctly and all packing materials and supports have been removed.
3. Be responsible for assisting the equipment start up personnel to assure correct equipment connections and rotation.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 27 02

SECTION 26 27 26 – WIRING DEVICES

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of ANSI/NFPA 70 - National Electric Code.

B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

C. Device specific standards and requirements are included in device specifications.

1.3 DESCRIPTION OF WORK

A. Provide and install wiring devices as required on the drawings and as specified herein.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 operation & maintenance manuals

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 Quality Assurance

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts shall be new and unused of current manufacture.

C. Provide all necessary accessories required for a complete and operable system.

D. Store wiring devices and accessories in original cartons and in clean dry space; protect from weather and construction traffic.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 WALL SWITCHES

A. Switches shall be:

1. UL listed for current and voltages indicated.
2. Shall comply with NEMA standard publication WD-1, “Heavy Duty Wiring Devices”.
3. Federal Specifications Test WS-896 E.
4. UL standard 20, 943 class A (GFCI) and 498.

B. Switches shall be 20 ampere heavy duty specification grade unless noted.

C. Switches shall have provisions for back and side wiring, screw clamp type suitable for solid or stranded wire with separate green ground screw.

D. Switches color shall be coordinated with architect.

E. Switches shall be made of nylon or high impact resistant material.

F. Modular switches with pigtailed terminals are allowed.

G. Supply the following:

1. Wall switch with:

a. 20 ampere, 120/277 volt rating.
b. Toggle handle.
c. Single-pole, double-pole, 3-way and 4-way switches shall be available.
d. Approved vendors are: Cooper, Hubbell Wiring, Leviton, and Pass & Seymour.

2. Single pole 0-10 volt slide dimmer switch with:

    a. 120 volt rating.
    b. On/Off rocker switch.
    c. Preset levels may be maintained by use of On/Off switch.
    d. Power leads may be integral.
    e. Solid state circuitry.
    f. Appropriately sized Lamp de-buzzing coil located in an acoustically isolated area.
    g. Heat sink.
    h. Face plate.
    i. Size dimmers at 125% of connected load.
    j. Approved vendors are: Lutron, Pass & Seymour.

3. Three way 0-10 volt slide dimmer switch from one location with:

    a. 120 volt rating.
    b. On/Off rocker switch.
    c. Preset levels may be maintained by use of On/Off switch.
    d. Power leads may be integral.
    e. Solid state circuitry.
    f. Appropriately sized lamp de-buzzing coil located in an acoustically isolated area.
    g. Heat sink.
    h. Face plate.
    i. Size dimmers at 125% of connected load.
    j. Approved vendors are: Lutron, Pass & Seymour.

2.3 RECEPTACLES

A. Receptacles shall be:

1. UL listed for current, uses and voltages indicated.
2. Tamper resistant.
3. Shall comply with NEMA standard publication WD-1 and WD-6 standards.

B. Receptacles shall be specification grade unless noted.

C. Receptacles shall have provisions for back and side wiring, screw clamp type suitable for solid or stranded wire with separate green ground screw.

D. Receptacle color shall be coordinated with architect.

E. Modular receptacles with pigtailed terminals are allowed.

F. Receptacles shall be made of nylon or high impact resistant material.

G. Receptacles installed in wet or damp locations shall be weather resistant.

H. Receptacles shall be supplied with face plate.

I. Supply the following:

1. Duplex NEMA 5-20R heavy duty straight blade (Tamper Resistant) receptacles with:

    a. 20 ampere, 120 volt rating.
    b. Standard face shape.
    c. 2-pole, 3-wire grounding
    d. Approved vendors are: Cooper, Hubbell Wiring, Leviton, and Pass & Seymour.

2. Weather Resistant (Tamper Resistant) Duplex NEMA 5-20R

    a. 20 ampere, 120 volt rating
    b. 2-pole, 3-wire grounding
    c. Approved vendors: Cooper, Hubbell Wiring, Leviton, and Pass & Seymour

3. GFCI (Tamper Resistant) Duplex NEMA 5-20R receptacles with:

    a. 20 ampere, 125 volt rating.
    b. Standard GFCI face.
    c. GFCI compatible face plate.
    d. 2-pole, 3-wire grounding.
    e. Approved vendors are: Cooper, Hubbell Wiring, Leviton, Pass & Seymour.

4. Heavy duty flush single straight blade receptacle with:

    a. Standard face shape.
    b. NEMA 5-15R (Tamper Resistant)

        1) 15 ampere, 125 volt rating.
        2) 2-pole, 3-wire grounding.

    c. NEMA 5-20R (Tamper Resistant)

        1) 20 ampere, 125 volt rating.
        2) 2-pole, 3-wire grounding.

    d. NEMA 14-30R (Tamper Resistant)

        1) 30Ampere, 125/250 volt rating.
        2) 3-pole, 4-wire grounding.
        3) Glass reinforced

    e. NEMA 14-50R

1) 50 ampere, 125/250 volt rating.
2) 3-pole, 4-wire grounding.
3) Glass reinforced.

f. Approved vendors are: Cooper, Hubbell Wiring, Leviton, and Pass & Seymour.

5. Flush single twist-lock receptacle with:

a. Standard face shape.
b. NEMA L6-15R

1) 15 ampere, 250 volt rating.
2) 2-pole, 3-wire grounding.

c. NEMA L7-15R

1) 15 ampere, 277 volt AC rating.
2) 2-pole, 3-wire grounding.

d. NEMA L6-20R

1) 20 ampere, 250 volt rating.
2) 2-pole, 3-wire grounding.

e. NEMA L7-20R

1) 20 ampere, 277 volt AC rating.
2) 2-pole, 3-wire grounding.

f. NEMA L15-20R

1) 20 ampere, 250 volt AC rating.
2) 3-pole, 4-wire grounding.

g. Approved vendors are: Cooper, Hubbell Wiring, Leviton, and Pass & Seymour.

2.4 PLATE COVERS

A. All plate covers shall be brushed stainless steel. Where devices are located on walls containing stone or brick provide brushed stainless steel smooth.

B. Cast metal plates: Die cast profile, ribbed for strength, flash removed, primed with gray enamel, furnished complete with four mounting screws.

C. Steel plates: Hot dip galvanized, 1.25 oz/sq. ft. minimum.

D. Weatherproof receptacle plate shall be heavy duty type, cast aluminum with a deep cover hood to provide weatherproof protection while an attachment plug cap is inserted. Plate shall be code approved as “suitable for wet locations while in use”. Weatherproof cover shall be provided with ¼” padlock hole. Plate must meet OSHA lockout/tagout requirements. Provide a padlock for each weatherproof receptacle cover installed on the project. All padlocks shall be keyed alike. Provide twenty spare keys for Owner’s use.

E. Surface box plates: Beveled, steel, pressure formed for smooth edge to fit box.

F. Where two-gang boxes are required for single gang devices, provide special plates with device opening in one gang and second gang blank.

G. Approved vendors are: Cooper, Hubbell Wiring, Leviton, and Pass & Seymour.

H. Provide phone plates with mounting studs where should as wall mounted data

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify outlet boxes are installed at proper height.

B. Verify wall openings are neatly cut and will be completely covered by wall plates.

C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

D. Inspect each wiring device for defects.

E. Operate each wall switch with circuit energized and verify proper operation.

F. Verify that each receptacle device is energized.

G. Test each receptacle device for proper polarity.

H. Test each GFCI receptacle device for proper operation.

I. Test that each receptacle is properly grounded.

J. Adjust devices and wall plates to be flush and level.

3.2 FIELD MEASUREMENTS

A. Field verify proper location of all wiring devices with field conditions and adjust accordingly.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

B. Install products in accordance with manufacturer's instructions.

C. Install devices plumb and level.

D. Install switches with OFF position down.

E. Install vertical receptacles with grounding pole on top and horizontal receptacles with grounding pole to left.

F. Connect wiring device grounding terminal to outlet box with bonding jumper.

G. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

H. Connect wiring devices by wrapping solid conductor around screw terminal, or inserting into wire clamp. Wrapping conductor not allowed for stranded wire.

I. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

J. Mount switches at heights shown in specification 26 05 37 unless otherwise noted. Coordinate location with architectural detail.

K. In areas where ceiling mounted receptacles and outlets are shown, the face of the receptacle or outlet is to be flush with the ceiling finish. For grid ceilings, provide proper support framing such that receptacles and outlets can be used from the ceiling below without damaging the ceiling tile.

L. Preparation:

1. Provide extension rings to bring outlet boxes flush with finished surface.
2. Clean debris from outlet boxes.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 27 26

SECTION 26 27 28 – CIRCUIT & MOTOR DISCONNECTS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

B. Conform to current National Electrical Manufactures Association (NEMA) Standards.

C. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

1.3 DESCRIPTION OF WORK

A. Furnish and install heavy-duty fusible type disconnect switches of types scheduled at locations shown on the drawings and as specified herein.

B. Furnish and install other disconnect switches as necessary and required with proper number of poles, voltage and enclosure type ratings as required for the application and as required by the National Electrical Code.

C. The drawings may or may not indicate disconnects. Disconnects shown on drawings shall be installed for that piece of equipment, even if the disconnect is not required by code.

D. Provide proper environmental enclosure for disconnect depending on the mounting location.

E. Provide fused or non-fused disconnect as required for proper protection of the equipment.

F. Provide all code required disconnects. Assume responsibility for reviewing equipment connections and starting equipment provided with the equipment and determining if disconnects are required.

G. For fused disconnects, provide appropriately sized fuses for the equipment.

H. Install and wire mechanical system starters. See other portions of specifications indicating requirements for work.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 DISCONNECTS

A. Disconnect switches shall be heavy duty switch operated type with cover interlock and enclosed arc chamber, quick make and quick break and provision for padlocking in either the open or closed position. All heavy duty, safety switches 30 to 600A, shall be provided with Class R rejection style fuse clips. The combination rating of the heavy-duty switch and R fuse shall be 200,000 symmetrical amps and labeled as such.

B. Approved manufacturers: Base Bid: Square D. Voluntary Alternate Bid: Cutler Hammer, General Electric or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify equipment is in compliance with approved submittal drawings.

3.2 FIELD MEASUREMENTS

A. Field verify locations of disconnects with other trades. Adjust as required to meet field conditions and code requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Mount per Section 26 05 29.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Motor And Equipment Connections

1. Check HVAC motor schedule to ascertain if disconnect is required at motor. If disconnect is not shown on drawing and the NEC requires a disconnect, it shall be furnished and installed by this Division 26.
2. The location of motors and motor equipment shown on plans including disconnect switches and starters are approximate unless otherwise specified. Obtain the exact locations from the Architect or from Division furnishing the equipment.
3. Other contractors will furnish combination starters for installation. Refer to the HVAC drawings to determine starter locations. If starter locations are not indicated, determine best starter location on site.
4. Where a VFD or combination starter is indicated on the HVAC motor starter schedule and has a disconnect as part of it, a separate disconnect shall not be required.

5. HVAC temperature control connections will be done by the HVAC temperature control contractor.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 27 28

SECTION 26 43 13 - SURGE PROTECTION DEVICES

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. American National Standards Institute.

B. Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.1, C62.41-2002, and C62.45).

C. IEEE Std. 1100 “The Emerald Book” Section 8.4.2.5.

D. Canadian Standards Association (CSA).

E. Federal Information Processing Standards Publication 94 (FIPS PUB 94).

F. National Fire Protection Association (NFPA 20, 70, 75, and 78).

G. Underwriters Laboratories UL 1449 third edition effective September 29th, 2009.

H. The system shall be UL listed as a complete system under UL 1449 Standard for Surge Protection Devices.

I. Underwriters Laboratories UL 96A Lightning Protection Master Label and NFPA 780 – 20kA (In)nominal discharge rating.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete and operable surge suppression device as indicated on the drawings and as specified herein.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. Manufacturer will provide the following type test documentation for approval:

1. Provide UL-1449, Third Edition documentation showing the unit Voltage Protection Rating (VPR) and all “Engineering Considerations”.
2. Provide third part test documentation showing nominal discharge current of 20kA. Reports will clearly show that tests were performed on a complete device including all necessary fusing, disconnects, and monitoring systems.
3. Provide third part test documentation showing that the unit will survive the specified Short Circuit Current Rating without the need for additional or external fusing.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. The following shall be provided in addition to items listed above.

1. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer’s products that are similar in material, design, and extent to those indicated for this Project.
2. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
3. Manufacturer’s Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
4. Manufacturer must carry replacement parts.
5. Manufacturer shall have a minimum of five years experience in applying surge protection products in the application specified for this project.

1.8 WARRANTY

A. The manufacturer shall provide a full ten-year parts and five-year labor warranty for service entrance units and a five year parts warranty for branch circuit units. This warranty shall be from date of shipment against any part failure when installed in compliance with manufacturer's written instructions, UL listing requirements, and any applicable national or local electrical codes.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, and repair parts cost.

C. Due to the sensitive nature of this type of equipment, the Contractor agrees that warranty service shall be completed promptly, and that where necessary, premium freight (i.e. Fed-Ex or equal) will be used to obtain replacement parts. Service response requirements shall include the following:

1. Twenty-four (24) hour phone number.
2. Ability to restore functionality within eight (8) hours after notification on a twenty-four (24) hour basis.

D. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE EQUIPMENT

A. Approved Manufacturers

1. LEA – PV400
2. Liebert. – SI-040-C
3. Mersen – STXT

B. Equipment shall be a multi-stage parallel protector rated for 120/208VAC, 3-phase, 4-wire plus ground based on locations shown on plans. The equipment's minimum surge current capacity shall be 400kA per phase (L-N plus L-G) and 200 kA per mode (L-N, L-G, L-L and N-G).

C. The system protection modules shall contain a technology that utilizes a symmetrical array of metal oxide varistors (MOV).

D. All primary transient paths shall utilize copper wire, aluminum bus bar and lugs of equivalent capacity to provide equal impedance interconnection between phases. No plug- in module or components shall be used in surge carrying paths.

E. Each protection module shall have a visual indicator that signifies that the protection circuitry is on line. The unit shall not be taken off line to verify integrity of system. Redundant status indicators shall be mounted on the front of the door that monitors the system protection circuitry.

F. Each protection module shall have a capacitive filtering system connected in each Line to Neutral (L→N)(Wye) mode or Line to Line (L→L)(Delta) mode.

G. Protection modes: The TVSS shall provide Line to Neutral (L→N)(Wye), Line to Ground (L→G)(Wye or Delta), Line to Line (L→L)(Delta) and Neutral to Ground (N→G)(Wye) protection.

H. Service Conditions: Rate surge protective device for continuous operation under the following conditions, unless otherwise indicated:

1. MCOV: Maximum Continuous Operating Voltage of 115% or greater.
2. Operating Temperature: 30 to 120 degrees F.
3. Humidity: 0 to 85 percent, non-condensing.
4. Altitude: Less than 20,000 feet above sea level.

I. Equipment shall provide the following monitoring features: dry contacts, audible alarm with disable switch and surge counter.

2.2 NOISE FILTERING

A. Unit shall have high frequency noise filtering.

2.3 CONNECTIONS

A. All parallel connections to the surge protection device shall be installed per the manufacturer's recommendations and shall be kept as short as possible.

2.4 ENCLOSURE

A. The enclosure shall be NEMA 12 UL94-5V rated or metal at the branch panel. All panels shall be NEMA rated for the location.

2.5 UNIT STATUS INDICATORS

A. The unit shall have an integral status circuit that monitors the operational status of all modes of protection, including Line to Neutral, Line to Ground and Neutral to Ground. No manual testing is required to confirm the integrity of the suppression and filter systems. If the unit does fail, the LED will go out.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Verify proper power connections are installed.

D. Proceed with installation only after unsatisfactory conditions are corrected.

3.2 FIELD MEASUREMENTS

A. Verify feeder is less than 5 feet from main bus bar for remote mounted units.

3.3 DELIVERY, STORAGE & HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

B. Service Entrance:

1. The service entrance SPD will be mounted externally to the service entrance equipment. Mount the SPD to minimize phase and neutral lead lengths. Avoid sharp cable bends and twist the phase conductors around the neutral conductor when possible. The SPD will either be wired through a 60A, 3-pole breaker provided by the service entrance equipment, or if the breaker is not available or practical, shall be cabled directly to the equipment bus bar. In this case, an integral, non-fused disconnect will be provided in the SPD enclosure. See drawing details for additional information.
2. The specified service entrance /switchboard/ switchgear system shall be installed with the shortest lead length possible not to exceed five (5') electrical feet from the power conductor(s) it is protecting, must have a grounding of 25 Ohms (NEC Article 250.56) or less.

C. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

3.5 OWNER TRAINING

A. Provide complete operator training for the Owner's personnel.

END OF SECTION 26 43 13

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SECTION 26 51 13 – INTERIOR LIGHTING FIXTURES

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.

B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

C. Conform to Wisconsin Administrative Code, SPS 363.

D. Conform to National Fire Protection Association NFPA 101

E. Conform to American National Standards Institute ANSI C 82.11-1993

F. Conform to current National Electrical Manufactures Association Standards.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete interior lighting system as required on the drawings and as specified herein.

1.4 RELATED WORK ELSWHERE

A. Division 26

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. All materials, equipment and parts shall be new and unused of current manufacture.

C. Provide all necessary accessories required for a complete and operable system

1.8 WARRANTY

A. Lighting fixtures shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 FIXTURES AND COMPONENTS

A. Each bidder shall make his own count of all fixtures of the types indicated on the fixture schedule and they shall be furnished as outlined hereunder.

B. Basic catalog number only is given herein for fixtures; plaster rings, fixture ends or caps, suspension units, furnish mounting brackets and/or all other auxiliary parts necessary for a complete installation. Fixture shall be furnished as required, for a full and complete installation, even though not specifically called out on plans.

C. Should any parts of the fixtures be found to be bent or not in accord with their designed position, adjust, repair or replace at once the affected items as required.

2.3 FIXTURE LED ASSEMBLIES

A. All LED lamp assemblies shall be furnished with the light fixtures.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine each luminaire to determine suitability for lamps specified.

B. Examine each luminaire and replace noisy drivers.

3.2 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on drawings.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.
4. Type of ceiling material and suspension system must be submitted with fixture to ensure delivery of proper fixtures.
5. Approval of fixture drawings by the Electrical Engineer shall not relieve this section from responsibility of ceiling confirmation.
6. Clean electrical parts to remove conductive and deleterious materials.
7. Remove dirt and debris from enclosure.
8. Clean photometric control surfaces as recommended by manufacturer.
9. Clean finishes and replace damaged equipment.
10. Surface mounted luminaries:

    a. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.

11. Mounting hardware painting:

    a. Mounting hardware to be installed prior to the ceiling being painted.
    b. If it is not installed prior to that time, paint the support hardware.

12. Clearance heights:

    a. Lighting fixtures shall be mounted to maintain maximum head clearance height and that the bottom of the fixtures shall be even with the bottom of the ceiling joists.

13. Mounting locations:

a. The fixtures shall be mounted between the joists unless otherwise shown on the floor plans.
b. If fixtures are mounted perpendicular to joist, attach fixtures to the bottom of the joist and furnish steel support struts to the bottom of the joists for fixture support.

B. Install accessories furnished with each luminaire.

C. Connect luminaires using flexible conduit.

D. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

E. Bond products and metal accessories to branch circuit equipment grounding conductor

F. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in “factory new” condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

G. Final Testing:

1. Operate each luminaire after installation.
2. Confirm light controls properly operate intended fixtures.

3.5 OWNER TRAINING (NONE)

END OF SECTION 26 51 13

SECTION 27 10 00 – STRUCTURED CABLING SYSTEM

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. TIA/EIA 568-B.1 – Commercial Building Telecommunications Cabling Standard, Part 1: General requirements.

B. TIA/EIA 568-B.2. Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components.

C. TIA/EIA-569-A - Commercial Building Standards for Telecommunications Pathways and Spaces.

D. TIA/EIA-606 - Documentation.

E. TIA/EIA-607 - Commercial Building Bonding and Grounding Requirements.

F. IEEE 802.3an-2006 Physical Layer and Management Parameters for 10Gb/s Operation, Type 10GBASE-T.

G. Definitions:

1. MDF: Main Distribution Frame - this term is used interchangeably with MC (main closet).
2. IDF: Intermediate Distribution Frame - this term is used interchangeably with TC (telecommunications closet).
3. Access point: The outlet point for wireless LAN connection.
4. Backboard (normally called a backplane): A panel, wood or metal, used to mount termination hardware, on the wall that is adjacent to the relay rack. The plywood used for the backboard shall be fire rated ¾" plywood, painted off white.
5. Backbone Cable: A facility installed between different distribution points for the purpose of connecting system distribution points.
6. Back/Outlet Box: This box is used for terminating outlets.
7. Cable Labeling System: The printed labeling system that allows labeling of each telecommunications room (TR), all relay racks, patch panels, backbone and horizontal cables (this includes the grounding bus throughout the facility) and conduit runs.
8. Cable Tray: A mechanism that allows cable to be managed.
9. Communications Pole (also called Power Pole): A raceway that provides a patch from the ceiling to the furniture or floor. This pole might be dedicated or shared between the low voltage and the electrical services.
10. Conduit Run: Multiple sections of conduit placed to run cables inside. Typically a conduit run is when you cannot see the other end from the beginning.

11. Conduit Stub: A section of conduit place to run cables up (vertically) to an exposed cable route in the ceiling area. The conduit stubs sometimes run down through the floor to the ceiling area below or to a floor jack.
12. Contractor, Electrical (EC): The contractor that is awarded the bid or contract for described work in Division 26.
13. Cross-Connect: A facility enabling termination of cables and their inter-connection.
14. Cut-In: Creating a pathway, using the wall cavity as the pathway. Used when there is no conduit in place and raceway is not required vertically up the wall.
15. Exposed: This is any location that can be seen from an occupied space when the project is complete. The exceptions will be noted in this specification.
16. Entrance Facility: This area provides the entrance point for the communication services that enter the facility from the AP or the cable service provider. Lightning protection shall be installed, unless otherwise noted. This is where the outside cable type shall convert to inside cabling, unless otherwise noted. The outside cabling can be extended to the equipment room in metal conduit. It is recommended, however not required, that the lightning protection be installed as soon as the cable enters the building. The entrance facility may be shared with other services. The lightning protection shall be grounded to the building main ground (this can be done by attaching to the TMGB).
17. Firestop: Specialty material to re-establish a fire rated barrier. The material used is either cementitious or elastomeric.
18. Ground Busbar: The bar that is installed to attach the grounding conductors to. The one that is attached to the grounding electrode via a bonding conductor, typically located in the electrical switch room. Then a TBB is attached to the TMGB and allows all of the TGB's to be grounded. The one that is installed in all of the TR's is a telecommunications busbar (TGB).
19. Ground Conductor(s): The conductor that provides ground to the main grounding system, at the electrical panels is called the bonding conductor
20. Horizontal Cabling: The cable used to carry the information from the workstation or end device to the least significant distribution point. For the voice and data this will be the telecommunications room. The paging and security will be where distribution points are; normally this is in the equipment room or telecommunication room or equipment room.
21. Installer: Contractor installing the low voltage structured cabling and associated hardware.
22. J-Box: the boxes used to limit or extend distances within a conduit run or horizontal raceways. This box will be required to have the appropriate blank covers installed. The size is determined by the application and the guidelines in the TIA/EIA cabling standards.
23. J-Hook: A support device that is attached to the building structure and used to support structure cabling. The device is shaped like a J and the cables are laid in the open section of the J. There will be a retainer installed on all j-hooks.
24. Ladder Rack: A similar device to a cable tray, however more open elements. The ladder rack is usually installed where there is a high density of cables and accessibility is higher than normal.
25. Office Furniture: The landscape furniture used in place of fixed wall offices. Sometimes referred to as cubicle furniture.

26. Pathway: A vertical and horizontal path, used to place telecommunication cable inside of it.
27. Pull Cord/Wire: Cord placed in a cable path to pull wire through that same path.
28. RCDD: Registered Communication Distribution Designer. A certification provided by BICSI to individuals that have met criteria via education and testing to be certified to design telecommunication systems.
29. Service Cable Path: The service cable path is a route that allows a minimum of 10' of spare cable provided at the distribution point for the purpose of having spare cable for servicing the structure. This cable will be managed by support hardware as designated by the drawings provided. (There shall not be any service cable left at the station end other than the 6" to 10" left after the cable is terminated.)
30. Station Outlet: A device placed at the end of the horizontal cable to terminate the horizontal cable and connect the network equipment in the work area.
31. Telecommunications Contractor (TC): The contractor that is awarded the bid or contract for this work will include all the work as described in this specification, excluding the EC specified work.
32. Telecommunications Utility: The telecommunications utility will bring their services into the equipment room as designated on the floor plans.
33. Testing: Qualifying the cable for the necessary parameters described. The testing requires electronic and hardcopy of the test results. Sometimes referred to as Acceptance Testing.
34. Utility Pole: A raceway that provides a path from the ceiling to the furniture or floor. This pole might be dedicated or shared between the low voltage and the electrical services.
35. Work Area Outlet: A device placed at the end of the horizontal cable to terminate the horizontal cable and connect the network equipment in the work area.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete and operable data cabling system as indicated on the drawings and as specified herein.

B. Mount and connect owner furnished WAPs in new locations as indicated on plans as "WAP". Furnish and install data cables to this location and coil 25' service loop at structure supported with D ring. Mounting hardware to be supplied by owner. Assume all data outlets shown with WAP on drawings will require a WAP to be mounted. Coordinate with District which locations will have WAPs installed and which locations will be for future WAPs. Provide male end on all WAP device outlets shown at WAP location and terminate end in data closet on standard patch panel. Coordinate WAP IP addresses prior to installation

C. Division 27 Contractor to coordinate with Division 26 Contractor to determine where each party's work leaves off.

D. Furnish and install all head-end equipment and all field equipment. Furnish and install all low voltage cabling required for a complete and operating system.

E. The Division 26 Contractor to furnish and install standard backboxes and install special backboxes. Furnish and install conduit, fittings, and junction boxes. Provide 120 volt connections to equipment indicated on drawings and in the specification. Provide conduit stubs through walls to head-end to all field equipment.

F. Division 26 contractor to include all division 27 and 28 work in his bid.

G. Data Distribution Systems:

1. All data wiring shall be routed to the only MDF located in the data room, see drawings and details for required work.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Division 1.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. All drawings must be in CADD format.
5. Cable listing for each cable installed. Indicate in spreadsheet format showing room location, head-end location, and exact labeling. Provide on each end of each outlet.
6. Reduced size floor plan drawing (11" x 17"), showing building floor plan and location of all data outlets. Each of the rooms shall be numbered and the approximate location of each data outlet shall be shown. Prior to beginning that, determine if the owner has an existing number plan sequence in place, and if so, he shall use that numbering system for this project. Include such numbering system on his submittal data.

    a. Determine the numbering method for each of the outlets. As an example; a typical space which consists of five data outlets, the suggested format is to assign a cable number (1, 2, 3, 4, etc.) for each of the data outlets or a letter (A, B, C, D, etc.).

7. As a part of the shop drawing documentation, cable numbers, data outlet numbers, and patch panel jack numbers must be assigned and shown.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Division 1.

B. The following information shall be submitted in addition to the items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. Provide copy of written warranty.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Division 1.

B. Ensure all cables are less than 300 feet in length. Install cables in the shortest possible manner to ensure less than 300 feet is maintained.

C. A single contractor, who has at least five (5) year experience in furnishing similar data, voice, and video systems, shall supply all specified equipment and services.

D. Contractor shall employ a project manager for this project who has completed five (5) projects (similar in size) in the last 5 years and holds an active RCDD status. Credentials shall be available to the Engineer upon request.

1.8 WARRANTY

A. The data cabling system and labor for installation shall be provided with a minimum 20-year warranty from the cable manufacturer. This warranty shall cover material and workmanship.

B. The cable installed shall be a certified integrator, and shall provide cable manufacturer certified outlet components, such that the entire system is certified for the 20-year warranty. Provide a letter of verification as a part of the submittal drawings indicating that the warranty will be provided. Failure to provide this letter will cause submittal to be rejected and will require resubmittal.

C. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, and repair parts cost.

D. Submit a written warranty executed by the installer agreeing to repair or replace any data or phone cabling that fails within the warranty period.

E. During the guarantee period there shall be no charges to the Owner for service calls for guarantee work. However, when service work is required to repair items damaged by neglect, misuse, or vandalism, costs shall be reimbursed to this Contractor.

F. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 UTP DATA CABLE

A. All data and voice outlet cabling shall be:

1. Category 6 type
2. Sheath rated.
3. Plenum rated.
4. Data cable color shall be blue. I phone to be white
5. Approved manufacturers:

a. Amp.
b. Belden.
c. Berk-Tec.
d. Comm Scope.
e. Mohawk.
f. Superior Essex.
g. General Cable
h. West Penn

B. Cable shall meet the following requirements

Frequency	Power Sum Attenuation (Max) dB/100m	Power Sum Near End Cross Talk (min)	Power Sum ACR
1 MHz	2.0 dB	76 dB	72
4 MH	3.8 dB	67 dB	60
10 MHz	6.0 dB	61 dB	52
20 MHz	8.5 dB	56 dB	46
100 MHz	19.8 dB	46 dB	32
200 MHz	29.0 dB	42 dB	26
250 MHz	32.8 dB	40 dB	24
350 MHz	39.8 dB	38 dB	21
400 MHz	43.0 dB	37 dB	20
500 MHz	48.9 dB	36 dB	18

2.2 PLUG STRIP

A. Furnish and install a surge protected, cord connected plug strip for each rack. The plug strip shall be installed and attached to a surface with screws. Assume that the plug strip will be attached to the undersides of tables and plugged into the wall or power pole outlets, unless called out otherwise on drawings.

B. Plug strip shall be heavy-duty type and have a minimum of six single plugstrip receptacles. Provide unit with adequate length of cord to plug into outlet.

2.3 TELEPHONE LINE (DATA LINE) FOR FIRE ALARM PANEL

A. Even if not specifically shown on plans, furnish a telephone line for the fire alarm panel in this project. Provide outlet adjacent to panel. This outlet requires a continuous voice cable run from the outlet, back to the communications system main entrance via telecommunication closets.

2.4 WORK STATION COMMUNICATION OUTLETS - WALL MOUNTED

A. See floor plans for communication connector types to be included at each work station communication outlet location.

B. Each communication outlet shall consist of:

1. 4" square, 2 1/8" deep outlet box.
2. Single gang ring.
3. 1" conduit minimum stubbed into ceiling space, either stubbed into room, or if cable tray is provided, stubbed toward cable tray. If cable tray is not provided, stub toward corridor. Provide insulated connector on each end. Size conduit for quantity of cables shown.
4. Communication outlet plate angled type to allow for Cat6A cabling bending radius.
5. In those areas where devices are mounted on existing walls, provide an equivalent surface raceway system. Use Wiremold or Hubbell deep outlet box and surface metallic raceway.

C. Provide wall mount face plates, combination type. Face plate to include the following:

1. Nylon, lexan type. Color: to match wiring devices. Angled type.
2. 4-position openings for keystone type outlets; if more than 4 devices are shown at a location, provide 6-position openings for keystone type outlets.
3. Label holders.
4. Typed overlay label affixed above each outlet position indicating the outlet number.
5. All empty openings shall be closed.
6. Provide the appropriate communications device in the opening as shown on the floor plans.

D. Data outlets 568B, RJ45 configuration, angled-type.

1. Data jack color shall be:

a. Purple jacks for standard data drops.
b. White jacks for camera and door access system data drops.
c. Orange jacks for WAP’s system data drops.

2. Data outlets shall be power sum rated.

3. Outlets shall meet the following minimum requirements:

    a. Power sum next @ 100 Mhz = 40 dB.
    b. Next @ 100 Mhz = 42 dB.
    c. Attenuation @ 100 Mhz = .4 dB.
    d. Return loss @ 100 Mhz = 18 dB.

E. Wall phone mounting plates:

1. Stainless steel with two mounting studs. Coordinate exact plates to be compatible with owners phone system equipment

2.5 DATA JUMPER CABLES

A. Provide (1) 24" category 6 jumper cable for each data outlet, Keyless entry and WAP shown on power plans for the District's use for connecting between patch panel and switches. Color to match cabling color listed.

2.6 PATCH PANELS CATEGORY 6

A. Patch panel shall be as follows. All patch panels shall be power sum rated and tested in a link configuration. Devices shall have same rating as station outlets.

1. Category 6.
2. 48 jack high density assembly.
3. Each jack shall have an associated "type-on" label for marking and shall be marked.
4. Each patch panel shall have associated with it, a rear mounted and front mounted metal wire manager unit.
5. Each patch panel shall be identified with an engraved nameplate. Plate shall be designated as: "Data Distribution Patch Panel #1". The next patch panel shall be identified as "Patch Panel #2". etc. For projects where there are more than 1 network rack, each rack shall be further identified with a label indicating that it is Data Network Rack #1, #2, etc.
6. Each patch panel rack/enclosure shall have vertical wire management on both sides.

2.7 WIRE MANAGEMENT PANELS

A. Front mounted:

1. Ortronics OR-808004759.
2. Panduit WMPH2 (horizontal front and back) or WMPHF2 (horizontal front only).
3. AMP 558331-1.
4. Hubbell equal: PT #MCCWMP175P419.
5. Krone 6653-2-735-00 (front & back)

B. Rear mounted:

1. Ortronics OR-808004410.

2. Panduit WMPH2 (horizontal front and back) or WMPHF2 (horizontal front only).
3. AMP 558331-1.
4. Hubbell equal: PT #MCCMP2USAD.
5. Krone 6653-2-735-00 (front & back)

C. Vertical mounted:

1. Ortronics OR-808004859.
2. Panduit WMPVS20 (vertical front and back) or WMPVSF20 (vertical front only) or WMPVC20 (vertical back only). Panduit WMPUS may be used in lieu of stacking two WMPUS025 units.
3. AMP 558334-1.
4. Hubbell equal: PT #MCCPSR4 (4 rings per pk)

2.8 PATCH PANEL RACKS

A. Open Mounting Rack - floor mounted:

1. 84" high.
2. 19" standard width.
3. For each 48 unit or less patch panel assembly, provide one front mounted wire manager panel for routing of hub cables and one rear mounted wire manager panel for controlling cables entering back of patch panel.
4. Provide appropriate vertical wire manager loops to provide a training and attachment point for vertically run cables. Assume that a minimum of four will be required per enclosure. Actual location to be determined in field based on where cables enter and exit cabinets.
5. Constructed of aluminum.
6. Both sides drilled.
7. Hole mounting pattern: 5/8", 5/8", 5/8".
8. Rack shall be bolted to floor.
9. Rack shall be bonded to grounding system. Provide bonding jumper from rack to nearest available grounding source with ground point provided in room. Bond to ground point.
10. Provide a minimum of one solid equipment tray double ended, 18 3/4" deep.
11. Provide strut frame to support cables to above ceiling.
12. Provide horizontal rack mounted power strip including 8 outlets (4 in back and 4 in front). Provide an internal TVSS unit. Plug strips shall be connected to a cord. Hubbell MCCPSS19TS or equal.
13. Provide horizontal and vertical wire management panels. Provide wire management panels front and rear of each patch panel and vertically along both sides.
14. Manufacturer:

    a. Ortronics OR-604004600 - rack/OR60400006-tray.
    b. Panduit CMR19X84/tray.
    c. Hubbell equal PT #HPW84RR19 - shelf PT #MCCC519.
    d. Lucent equal.

e. B-line equal.
f. PFT equal.
g. CPI equal.

2.9 DATA EQUIPMENT LABELS

A. See specification section 26 05 53 for label materials.

2.10 PLYWOOD BACKBOARD

A. Provide 4 x 8 fire resistant painted plywood, AC grade, good one side, where shown on walls. Paint plywood white with fireproof paint. Provide cutout for flush receptacles. Furnish and install extension rings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Verify proper power connections are installed.

D. Proceed with installation only after unsatisfactory conditions are corrected.

E. All wiring shall test free from grounds and shorts.

3.2 DELIVERY, STORAGE & HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.3 INSTALLATION

A. All voice and data jacks to be labeled at device location and origination within 6” of end of cable.

B. Provide complete testing and documentation as listed in Operation & Maintenance Manuals.

C. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer’s recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer’s recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment, and written notice received from Architect stating that these conditions exist at building site.

D. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in “factory new” condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

E. Raceways:

1. All 120 volt wiring shall be in a conduit system separate from other building wiring.
2. All 120 volt wiring shall be in minimum ¾” steel raceway. Below floors to be rigid steel conduit.
3. There shall be no sharp edges with installed materials.

F. Cable:

1. Cable type, size, and quantity to be as shown on drawings. Vendor to verify exact cable required based on the equipment and provide appropriate cable.
2. All wire runs shall be continuous lengths, without splices.
3. All wiring systems shall be color coded as shown on the drawings. Green conductors shall be used only for grounding conductors, white only for neutral conductors and black shall be reserved for 120-volt line.
4. Marker strips shall be attached to the field wiring. These markers shall not change when devices are replaced during repair or maintenance.
5. Within equipment cabinets, all wires and cables shall be contained in wire management channels such as Panduit or equal, and dressed and labeled in such a manner that all wires may be easily traced, and such that they do not obstruct access to components which may need to be replaced or serviced.
6. All low voltage cabling to be routed in “D” rings or in cable tray.

G. Lighting & Surge Protection:

1. All electrical circuits supplying power to system components furnished and installed under this section shall be equipped with surge protectors.

H. Grounding:

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier’s recommendations.

a. Each cabinet frame shall be grounded. Equipment cabinets shall be bonded directly to the building electrode grounding.
b. All exterior panels of cabinets shall be bonded to the cabinet frame.
c. All equipment installed in a cabinet shall be bonded to the cabinet frame.

I. Final Testing:

1. The completed data system shall be fully tested by the Contractor. Upon completion of a successful test, certify in writing to the Owner.

J. Conduit stubs: The plan notes indicate, in a number of locations, the appropriate termination point for conduit stubs. In areas where ceilings are unfinished or ceilings are inaccessible by either height or for other reasons, the conduit stubs shall be extended to a further location to an accessible area. Lay out conduit runs such that all data installation runs are 300' or less.

K. Numbering and labeling:

1. All communication outlets shall be provided with an overlay label indicating the outlet number. This shall be provided for all devices mounted in the communications faceplate.

L. Data and Voice cables – UTP:

1. Shall be installed in raceways and cable trays where applicable.
2. Where cable is run in the open, it shall meet the following criteria:

a. Routed through "j-hook" or "D-ring" system.
b. Maintain at least a 12" separation from fluorescent or neon lighting fixtures.
c. Maintain at least a 3.3' separation from transformers, motor or other sources of electromagnetic fields.
d. Maintain the following separation from unshielded power cables - 36".
e. Maintain separation from under cabinet fluorescent fixtures installed on modular furniture.
f. Do not route within 50' of arc welders.

M. Cable Termination:

1. All cable conductors shall be terminated per EIA/TIA cable terminating standards as recommended by the manufacturer of the data system.

N. Cable Support & Raceways:

1. In areas where cable trays are provided, cables shall be installed within the trays. Extend cables from trays to conduit stubs down to outlets.

2. In areas where there are not accessible ceilings, cables shall be installed in surface mounted, non-metallic or metallic raceway as specified in specification section 26 0534. Provide all ceiling raceways where multiple cables are run with a minimum of 50% additional space to allow for future cables to be added. If surface raceway size is shown on drawings, provide that size or larger or multiples of the size shown as required.
3. Above accessible ceilings, a "J-hook" support system shall be used throughout the ceiling space, tunnel space, mezzanines, and other areas where cables are run. The "J" shall have flat bottom to eliminate single point stress on cables supported. Cables shall not be installed in a hap-hazard manner across the ceiling grid system. The following method shall be used:

    a. Conduits that are stubbed into the accessible ceiling space that are acting as cable raceways shall be extended into the nearest corridor space, or, as an option, install a sleeve through any wall separating the room from the corridor area.
    b. Cables shall be routed at 90 degrees from the room to the J-hook support system in the corridor. The corridor area shall generally be defined as the area where the J-hook support system shall be installed. However, in the event that there is not adequate corridor space, the J-hook system may be moved into the adjacent rooms.
    c. J-hook system shall be installed in straight lines perpendicular, right angle to the building walls. Groups of J-hooks shall be used where the single J-hook system is not adequate to support the cabling.
    d. The support system shall be used up to the conduits that feed the cables into the outlet or cable distribution points. Mark the record drawings to indicate the approximate path of the support system.
    e. Mark the "record drawings" to indicate the approximate path of the J-hook system.

4. Maximum spacing between J-hooks is to be 3'.

O. Provide and install all wall sleeves and penetrations. Any place that a wall is penetrated to route cable through the wall, the contractor shall provide a through-the-wall sleeve. This may be PVC conduit in those areas where plenum cable is not used. It shall be steel conduit with insulated connectors on ends in those areas where plenum ceilings are used. Assume that for each door entering each room, to include in pricing, the cost of providing and installing one sleeve above all doors entering rooms. These sleeves shall be installed above the ceiling grid.

P. In those areas where there is not a ceiling, all system cables shall be routed through conduit, through the non-ceiling area, into an area where there is ceiling cavity. There shall be no open cables routed through ceiling areas unless it is indicated otherwise on the drawings.

Q. Cable Labeling Scheme:

1. The Owner has implemented an existing data cabling and patch panel outlet labeling scheme which the contractor will be required to follow for this project.

2. The scheme labels the cable and outlet numbers based on the telecommunications closet location, patch panel location within that rack, and the outlet number on that patch panel. The contractor will be required to meet with the owner's telecommunications facility coordinator prior to providing data cabling. For this project the contractor will be required to determine that prior to equipment and cable listing submittal, and from that information, provide the appropriate label numbers on the submittal documents. This submittal will be required prior to installation.

R. Installation Of Cabling In Existing Facilities:

1. The following shall be the criteria for the installation of low voltage systems in existing facilities:

a. All cable shall be run concealed. This shall be:

1) Above grid ceilings where grid ceilings or other ceiling structures are available. See description above for installation in ring support system or tray.
2) In raceway; in open ceiling spaces such as mechanical rooms, shops, storage facilities.
3) In surface raceway; in finished spaces, such as; classrooms, offices, corridors and hallways.
4) Provide surface raceway with accompanying surface boxes on ceilings and walls.

b. Provide and install wall sleeves and penetrations. Any place that a masonry wall is penetrated to route cable through the wall, provide a through-the-wall sleeve. It shall be steel conduit with insulated connectors on the end in those areas where plenum cable is used.

c. In those areas where through-the-floor or through-the-ceiling, or through-corridor raceways are indicated, assume the following:

1) Steel raceways shall be terminated with insulated bushings or connectors.
2) Where raceways are run through masonry walls, the hole through the wall shall be patched tight around the raceway using grout.
3) Where raceways are run through existing open ceiling areas, such as stairwells, the raceway shall be installed tight to the ceiling and run parallel or perpendicular to the existing wall/ceiling angles.

d. Floor/ceiling penetrations:

1) Provide all set up, clean up, and any moving and reinstallation of Owner's equipment as necessary for core drilling floor and ceiling penetrations. Assess the existing areas above and below and make those penetrations in an area appropriate.
2) Relocate any ceiling or floor equipment that may be required to make the penetrations.

e. Installation of devices in existing spaces:

1) Move and reinstall any bookcases, desks, tables, chairs, or any other Owner's equipment that is in place that requires relocation to allow the installation of the new equipment. This should be worked out with the owner in advance of installation. Coordinate work times with owner or building tenant in occupied spaces.

f. Installation of patch panels in existing racks:

1) New patch panels shall be installed in existing racks. Relocate any equipment that is presently in the rack to accommodate the patch panels such that the new patch panels are adjacent to the existing cable patch panels. Relocate existing electronic equipment.

S. Patch Panel Installation:

1. Patch panels shall be installed and connected such that the incoming cables are grouped by rooms, spaces, and departments. It will be the contractor or his supplier's responsibility to initially meet with the Owner to determine what the requested groupings are.
2. The submittal drawings for the data system shall include front elevations of all patch panels should be shown with a number that will be associated with each patch panel jack. See system documentation for additional requirements. There shall be a listing indicating which jack is connected to which outlet, i.e. room space or department.
3. Incoming cables to patch panels shall be neatly trained and attached via cross-frame members or other method to hold cables independent of patch panel jacks.

3.4 OWNER TRAINING (NONE)

3.5 SPARE EQUIPMENT (NONE)

END OF SECTION 27 10 00

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SECTION 27 51 18 - DANCE ACTIVITY ROOM SOUND SYSTEM

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 – National Electric Code.

B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

C. Conform to current Telecommunication Industry Association (TIA/EIA).

D. Compliant with limits for Federal Communication Commission (FCC) Class B device.

E. Conform to current National Electrical Manufacturers Associates (NEMA) Standards.

1.3 DESCRIPTION OF WORK

A. The equipment will be located in a wall mounted rack as shown on the floor plan.

B. Furnish and install a sound system in equipment rack. Provide all material as indicated on the drawings and as specified herein, contractor to install dual RCA input connections in the equipment rack to be used as a music connection.

C. All necessary equipment required to meet the intent of these specifications, whether or not listed within these specifications, shall be supplied and installed to provide a complete and operational system.

D. Furnish and install all head-end equipment and all field equipment. Furnish and install all low voltage cabling required for a complete and operating system.

E. See Specification 26 05 01 for alternate information.

1.4 RELATED WORK ELSEWHERE

A. Division 26 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. All drawings must be in CADD format.
5. Block diagram indicating major system components and their relationship with other components.
6. A complete riser diagram indicating all head-end and other components with wire type and wiring diagrams.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the items listed above.

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. Provide copy of written warranty.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

1.8 WARRANTY

A. The supporting devices shall be warranted for a period of not less than 1 year from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, and repair parts cost.

C. Submit a written warranty executed by the installer agreeing to repair or replace any equipment that fails within the warranty period

D. During the guarantee period there shall be no charges to the Owner for service calls for guarantee work. However, when service work is required to repair items damaged by neglect, misuse, or vandalism, costs shall be reimbursed to this Contractor.

E. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Package Sound System

1. Dance Activity Room

C. Definitions:

1. Auxiliary Input: The auxiliary inputs provide a means for the public address system user to use miscellaneous sound production equipment (boombox, phonograph, CD player, etc.) that has an output in the range of .1 - 1 volt.
2. Auxiliary Output: The purpose of the auxiliary output is to provide a sound system output to a device which has a sound recording system or another sound input system such as a part of a video/audio input cart to have a clean signal direct from the public address system.
3. AR: As required. As determined by site conditions, manufacturer's recommendations by system installer, and as shown on the drawings or as specified herein.

2.2 MAIN LIMITER/EQ LOUDSPEAKER PROCESSOR

A. Manufacturers:

1. Biamp Nexia CS 10x6 Digital signal processor
2. Biamp Volume 8 to be rack mounted next to the dual RCA jack

2.3 MIXER

A. Biamp Nexia CS as listed above.

2.4 POWER AMPLIFIERS

A. The amplifier shall have an electronic protection circuit as a safeguard against damage caused by overloads or shorted output. Approved and tested under U.L. standards 1711, 1480 and 813.

B. Manufacturer: The following equipment and manufacturers are representative of the type of equipment required. Size the amplifier as appropriate.

C. Manufacturer:

1. QSC ISA 800TI or equal

D. Provide power amplifiers as required to provide total headroom of at least 25% for the system.

2.5 LOUD SPEAKERS (COAX)

A. Manufacturer:

1. Hanging Speakers:

a. Sound Tube RS600I-WH
b. Mounting Hardware

B. Provide all necessary mounting hardware.

2.6 MEDIA PLAYER

A. Manufacturer: Denon DN-300ZB Media Player with Bluetooth.

2.7 WIRELESS MICROPHONE

A. Provide wireless microphone as indicated in equipment list.

B. Wireless Lapel Microphone.

1. Manufacturers: Shure PGXD14/85 with rack mount kit

C. Wireless Handheld Microphone.

1. Manufacturers: Shure PGXD24/Beta58 with rack mount kit

2.8 ENCLOSURES

A. Wall Rack.

1. The equipment shall be housed in a vertical rack which shall have 34 inches of panel space. The unit shall be constructed of 16 gauge steel with panel mounting rails of 14 gauge. All joining steel must be welded and bonded to form a sturdy, solid assembly. Use of lighter gauge steel and bolted-type construction does not provide the rigidity desired and, thus, it is not acceptable.
2. Manufacturer:

a. Lowell LWR-1623 Equipment Rack Provide with:

1) Lowell ACS-1512 Power Strip
2) Lowell Drawer UDE-314
3) Lowell US-314 Shelf
4) Lowell SG6P-3 Punched panel for Volume-8 and Dual RCA plate

5) Lowell LFD-16P Plexiglass Front Door

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Verify proper power connections are installed.

D. Proceed with installation only after unsatisfactory conditions are corrected.

E. All wiring shall test free from grounds and shorts.

F. Complete system shall be installed per manufacturer's recommendations and all applicable codes.

G. Provide equipment as follows:

Description	Dance
Biamp Nexia CS with Volume 8	1
Power Amplifier	AR
Loud Speakers	AR
Wireless Handheld Microphone	1
Wireless Lapel Microphone	1
Media Player	1
Enclosure	1

H. Where x's are shown in boxes, provide that component. Where AR is shown in the box, provide quantity as required and as shown on floor plans. Where specific quantity is shown in box, provide that quantity of device.

I. Systems to be programmed to all of the Wireless Microphones and Media Player to be shared between both the Café Sound System and the Courtyard Sound system

3.2 FIELD MEASUREMENTS

A. Mounting heights as shown on drawings and details. Coordinate final locations with on-site architect prior to rough-in.

3.3 DELIVERY, STORAGE & HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment, and written notice received by ESC from Architect stating that these conditions exist at building site.
4. Install power supplies as required based on equipment per manufacturer. Coordinate power requirements, rough-in, and location with electrical contractor.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Raceways

1. All 120 volt wiring shall be in a conduit system separate from other building wiring.
2. All 120 volt wiring shall be in minimum ¾" steel raceway. Below floors to be rigid steel conduit.
3. All screws used for anchoring conduit and J-boxes parts in public or resident areas shall have tamperproof screws.
4. All screws used on signal devices, including speakers, shall be of the tamperproof type.
5. There shall be no sharp edges with installed materials.

D. Cable

1. Cable type, all speaker wiring to be WPW 25226 or equal, all microphone and aux jacks to be WPW 25292 or equal and wiring to Volume 8 to be manufacture recommended cable. Vendor to verify exact cable required based on the equipment and provide appropriate cable.
2. All cables to be plenum rated.
3. All wire runs shall be continuous lengths, without splices.
4. All wiring systems shall be color coded as shown on the drawings. Green conductors shall be used only for grounding conductors, white only for neutral conductors, and black shall be reserved for 120-volt line.

5. All control wiring systems shall use stranded copper conductors terminated with crimp connectors or lugs, correctly sized for the termination, and applied to the conductor with a crimping tool intended for use with the lug used, or to terminal strips providing 360 degree capture of the wire.
6. All field terminal blocks shall be 300 volts minimum NEMA rated, or as required by the NEC for the specific application, and be able to accommodate no less than two (2) #14 AWG wires.
7. Marker strips shall be attached to the field wiring. These markers shall not change when devices are replaced during repair or maintenance.
8. Within equipment cabinets, all wires and cables shall be contained in wire management channels such as Panduit or equal, and dressed and labeled in such a manner that all wires may be easily traced, and such that they do not obstruct access to components which may need to be replaced or serviced.
9. All low voltage cabling to be routed in J Hooks

E. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

    a. Each cabinet frame shall be grounded. Equipment cabinets shall be bonded directly to the building electrode grounding.
    b. All exterior panels of cabinets shall be bonded to the cabinet frame.
    c. All equipment installed in a cabinet shall be bonded to the cabinet frame.

F. Final Testing

1. The completed public address system shall be fully tested in accordance with NFPA by the Contractor in the presence of the Owner's representative and the Engineer. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner.
2. All wiring shall test free from all grounds and shorts.

G. Tests and Instructions

1. Checkout and final connections to the sound reinforcement system shall be made by a factory authorized representative of the products installed. In addition, the representative shall demonstrate operation of the complete system and each major component to the owner.
2. System field wiring diagrams shall be provided to this subcontractor by the system manufacturer prior to installation.
3. Upon completion of the installation, four (4) copies of complete operational instructions shall be furnished, complete with record drawings. Instructions shall include part numbers and names, addresses, and telephone numbers of parts source. Final payment shall not be made until operational and maintenance manuals have been received.
4. Upon completion of the installation of the equipment, the electrical contractor shall provide to the engineer a signed statement from the equipment supplier that the system has been wired, tested, and functions properly according to the specifications.

5. The conduit, outlets, terminal cabinets, etc., which form a part of the rough-in work shall be furnished and installed complete by the electrical contractor.
6. The balance of the system, including installation of the communications equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative, and the entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance by the Owner, shall be the responsibility of this subcontractor.
7. The vendor shall include in his cost, the cost of providing an 8 hour site visit during the second year of operation of the equipment. This equipment vendor shall furnish a credit memo to the school district for this 8 hour trip. It is understood that this credit memo covers a full 8 hours on site, in addition to any travel time or any other travel expenses.
8. All communication connections throughout the system shall be crimped by means of AMP lugs in all junction boxes. In terminal cabinets, all wiring shall be neatly laced, EZ code marked at both ends and terminated on Siemens 66M-50 punch blocks or approved equal.
9. Checkout and final connections to the communications system shall be made by a manufacturer's authorized representative for the products installed. In addition, the representative shall demonstrate operation of the complete system and each major component to the owner.
10. System field wiring diagrams shall be provided to the subcontractor by the system manufacturer prior to installation
11. Upon completion of the installation, four (4) copies of complete operational and maintenance instructions shall be furnished, complete with record drawings. Maintenance instructions shall include part numbers. Final payment shall not be made until operational and maintenance manuals have been received.
12. Upon completion of the installation, the electrical contractor shall provide to the engineer a signed statement from the equipment supplier that the system has been wired, tested, and functions properly according to the specifications.

3.5 OWNER TRAINING

A. Provide complete operator training for the Owner’s personnel.

B. Provide two (2) four hour training sessions on consecutive days at times set by the Owner. These should be scheduled as part of the Owner’s pre-occupancy transition training.

C. Provide a video tape training which can be used by the Owner for training new employees. This tape shall be carefully organized and segmented so that training may be given on the complete system, or on specific functions as may be appropriate.

D. Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

END OF SECTION 27 51 18

SECTION 27 51 19 - CREATIVE STUDIO SOUND SYSTEM

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 – National Electric Code.

B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

C. Conform to current Telecommunication Industry Association (TIA/EIA).

D. Compliant with limits for Federal Communication Commission (FCC) Class B device.

E. Conform to current National Electrical Manufacturers Associates (NEMA) Standards.

1.3 DESCRIPTION OF WORK

A. The equipment will be located in a wall mounted rack as shown on the floor plan.

B. Furnish and install a sound system in equipment rack. Provide all material as indicated on the drawings and as specified herein, contractor to install dual RCA input connections in the equipment rack to be used as a music connection.

C. All necessary equipment required to meet the intent of these specifications, whether or not listed within these specifications, shall be supplied and installed to provide a complete and operational system.

D. Furnish and install all head-end equipment and all field equipment. Furnish and install all low voltage cabling required for a complete and operating system.

E. See Specification 26 05 01 for alternate information.

1.4 RELATED WORK ELSEWHERE

A. Division 26 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. All drawings must be in CADD format.
5. Block diagram indicating major system components and their relationship with other components.
6. A complete riser diagram indicating all head-end and other components with wire type and wiring diagrams.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the items listed above.

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. Provide copy of written warranty.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

1.8 WARRANTY

A. The supporting devices shall be warranted for a period of not less than 1 year from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, and repair parts cost.

C. Submit a written warranty executed by the installer agreeing to repair or replace any equipment that fails within the warranty period

D. During the guarantee period there shall be no charges to the Owner for service calls for guarantee work. However, when service work is required to repair items damaged by neglect, misuse, or vandalism, costs shall be reimbursed to this Contractor.

E. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Package Sound System

1. Creative Studio

C. Definitions:

1. Auxiliary Input: The auxiliary inputs provide a means for the public address system user to use miscellaneous sound production equipment (boombox, phonograph, CD player, etc.) that has an output in the range of .1 - 1 volt.
2. Auxiliary Output: The purpose of the auxiliary output is to provide a sound system output to a device which has a sound recording system or another sound input system such as a part of a video/audio input cart to have a clean signal direct from the public address system.
3. AR: As required. As determined by site conditions, manufacturer's recommendations by system installer, and as shown on the drawings or as specified herein.

2.2 MAIN LIMITER/EQ LOUDSPEAKER PROCESSOR

A. Manufacturers:

1. Biamp Nexia CS 10x6 Digital signal processor
2. Biamp Volume 8 to be rack mounted next to the dual RCA jack

2.3 MIXER

A. Biamp Nexia CS as listed above.

2.4 POWER AMPLIFIERS

A. The amplifier shall have an electronic protection circuit as a safeguard against damage caused by overloads or shorted output. Approved and tested under U.L. standards 1711, 1480 and 813.

B. Manufacturer: The following equipment and manufacturers are representative of the type of equipment required. Size the amplifier as appropriate.

C. Manufacturer:

1. QSC ISA 800TI or equal

D. Provide power amplifiers as required to provide total headroom of at least 25% for the system.

2.5 LOUD SPEAKERS (COAX)

A. Manufacturer:

1. Hanging Speakers:

a. Sound Tube RS600I-WH
b. Mounting Hardware

B. Provide all necessary mounting hardware.

2.6 MEDIA PLAYER

A. Manufacturer: Denon DN-300ZB Media Player with Bluetooth.

2.7 WIRELESS MICROPHONE

A. Provide wireless microphone as indicated in equipment list.

B. Wireless Lapel Microphone.

1. Manufacturers: Shure PGXD14/85 with rack mount kit

C. Wireless Handheld Microphone.

1. Manufacturers: Shure PGXD24/Beta58 with rack mount kit

2.8 ENCLOSURES

A. Wall-Rack

1. The equipment shall be housed in a vertical rack which shall have 34 inches of panel space. The unit shall be constructed of 16 gauge steel with panel mounting rails of 14 gauge. All joining steel must be welded and bonded to form a sturdy, solid assembly. Use of lighter gauge steel and bolted-type construction does not provide the rigidity desired and, thus, it is not acceptable.
2. Manufacturer:

a. Lowell LWR-1623 Equipment Rack Provide with:

1) Lowell ACS-1512 Power Strip
2) Lowell Drawer UDE-314
3) Lowell US-314 Shelf
4) Lowell SG6P-3 Punched panel for Volume-8 and Dual RCA plate

5) Lowell LFD-16P Plexiglass Front Door

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Verify proper power connections are installed.

D. Proceed with installation only after unsatisfactory conditions are corrected.

E. All wiring shall test free from grounds and shorts.

F. Complete system shall be installed per manufacturer's recommendations and all applicable codes.

G. Provide equipment as follows:

Description	Creative Studio
Biamp Nexia CS with Volume 8	1
Power Amplifier	AR
Loud Speakers	AR
Wireless Handheld Microphone	1
Wireless Lapel Microphone	1
Media Player	1
Enclosure	1

H. Where x's are shown in boxes, provide that component. Where AR is shown in the box, provide quantity as required and as shown on floor plans. Where specific quantity is shown in box, provide that quantity of device.

I. Systems to be programmed to all of the Wireless Microphones and Media Player to be shared between both the Café Sound System and the Courtyard Sound system

3.2 FIELD MEASUREMENTS

A. Mounting heights as shown on drawings and details. Coordinate final locations with on-site architect prior to rough-in.

3.3 DELIVERY, STORAGE & HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment, and written notice received by ESC from Architect stating that these conditions exist at building site.
4. Install power supplies as required based on equipment per manufacturer. Coordinate power requirements, rough-in, and location with electrical contractor.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Raceways

1. All 120 volt wiring shall be in a conduit system separate from other building wiring.
2. All 120 volt wiring shall be in minimum ¾" steel raceway. Below floors to be rigid steel conduit.
3. All screws used for anchoring conduit and J-boxes parts in public or resident areas shall have tamperproof screws.
4. All screws used on signal devices, including speakers, shall be of the tamperproof type.
5. There shall be no sharp edges with installed materials.

D. Cable

1. Cable type, all speaker wiring to be WPW 25226 or equal, all microphone and aux jacks to be WPW 25292 or equal and wiring to Volume 8 to be manufacture recommended cable. Vendor to verify exact cable required based on the equipment and provide appropriate cable.
2. All cables to be plenum rated.
3. All wire runs shall be continuous lengths, without splices.
4. All wiring systems shall be color coded as shown on the drawings. Green conductors shall be used only for grounding conductors, white only for neutral conductors, and black shall be reserved for 120-volt line.

5. All control wiring systems shall use stranded copper conductors terminated with crimp connectors or lugs, correctly sized for the termination, and applied to the conductor with a crimping tool intended for use with the lug used, or to terminal strips providing 360 degree capture of the wire.
6. All field terminal blocks shall be 300 volts minimum NEMA rated, or as required by the NEC for the specific application, and be able to accommodate no less than two (2) #14 AWG wires.
7. Marker strips shall be attached to the field wiring. These markers shall not change when devices are replaced during repair or maintenance.
8. Within equipment cabinets, all wires and cables shall be contained in wire management channels such as Panduit or equal, and dressed and labeled in such a manner that all wires may be easily traced, and such that they do not obstruct access to components which may need to be replaced or serviced.
9. All low voltage cabling to be routed in J Hooks

E. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

    a. Each cabinet frame shall be grounded. Equipment cabinets shall be bonded directly to the building electrode grounding.
    b. All exterior panels of cabinets shall be bonded to the cabinet frame.
    c. All equipment installed in a cabinet shall be bonded to the cabinet frame.

F. Final Testing

1. The completed public address system shall be fully tested in accordance with NFPA by the Contractor in the presence of the Owner's representative and the Engineer. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner.
2. All wiring shall test free from all grounds and shorts.

G. Tests and Instructions

1. Checkout and final connections to the sound reinforcement system shall be made by a factory authorized representative of the products installed. In addition, the representative shall demonstrate operation of the complete system and each major component to the owner.
2. System field wiring diagrams shall be provided to this subcontractor by the system manufacturer prior to installation.
3. Upon completion of the installation, four (4) copies of complete operational instructions shall be furnished, complete with record drawings. Instructions shall include part numbers and names, addresses, and telephone numbers of parts source. Final payment shall not be made until operational and maintenance manuals have been received.
4. Upon completion of the installation of the equipment, the electrical contractor shall provide to the engineer a signed statement from the equipment supplier that the system has been wired, tested, and functions properly according to the specifications.

5. The conduit, outlets, terminal cabinets, etc., which form a part of the rough-in work shall be furnished and installed complete by the electrical contractor.
6. The balance of the system, including installation of the communications equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative, and the entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance by the Owner, shall be the responsibility of this subcontractor.
7. The vendor shall include in his cost, the cost of providing an 8 hour site visit during the second year of operation of the equipment. This equipment vendor shall furnish a credit memo to the school district for this 8 hour trip. It is understood that this credit memo covers a full 8 hours on site, in addition to any travel time or any other travel expenses.
8. All communication connections throughout the system shall be crimped by means of AMP lugs in all junction boxes. In terminal cabinets, all wiring shall be neatly laced, EZ code marked at both ends and terminated on Siemens 66M-50 punch blocks or approved equal.
9. Checkout and final connections to the communications system shall be made by a manufacturer's authorized representative for the products installed. In addition, the representative shall demonstrate operation of the complete system and each major component to the owner.
10. System field wiring diagrams shall be provided to the subcontractor by the system manufacturer prior to installation
11. Upon completion of the installation, four (4) copies of complete operational and maintenance instructions shall be furnished, complete with record drawings. Maintenance instructions shall include part numbers. Final payment shall not be made until operational and maintenance manuals have been received.
12. Upon completion of the installation, the electrical contractor shall provide to the engineer a signed statement from the equipment supplier that the system has been wired, tested, and functions properly according to the specifications.

3.5 OWNER TRAINING

A. Provide complete operator training for the Owner’s personnel.

B. Provide two (2) four hour training sessions on consecutive days at times set by the Owner. These should be scheduled as part of the Owner’s pre-occupancy transition training.

C. Provide a video tape training which can be used by the Owner for training new employees. This tape shall be carefully organized and segmented so that training may be given on the complete system, or on specific functions as may be appropriate.

D. Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

END OF SECTION 27 51 19

SECTION 27 51 20 GAME ROOM SOUND SYSTEM

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 – National Electric Code.

B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

C. Conform to current Telecommunication Industry Association (TIA/EIA).

D. Compliant with limits for Federal Communication Commission (FCC) Class B device.

E. Conform to current National Electrical Manufacturers Associates (NEMA) Standards.

1.3 DESCRIPTION OF WORK

A. The equipment will be located in a wall mounted rack as shown on the floor plan.

B. Furnish and install a sound system in equipment rack. Provide all material as indicated on the drawings and as specified herein, contractor to install dual RCA input connections in the equipment rack to be used as a music connection.

C. All necessary equipment required to meet the intent of these specifications, whether or not listed within these specifications, shall be supplied and installed to provide a complete and operational system.

D. Furnish and install all head-end equipment and all field equipment. Furnish and install all low voltage cabling required for a complete and operating system.

E. See Specification 26 05 01 for alternate information.

1.4 RELATED WORK ELSEWHERE

A. Division 26 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. All drawings must be in CADD format.
5. Block diagram indicating major system components and their relationship with other components.
6. A complete riser diagram indicating all head-end and other components with wire type and wiring diagrams.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the items listed above.

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. Provide copy of written warranty.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

1.8 WARRANTY

A. The supporting devices shall be warranted for a period of not less than 1 year from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, and repair parts cost.

C. Submit a written warranty executed by the installer agreeing to repair or replace any equipment that fails within the warranty period

D. During the guarantee period there shall be no charges to the Owner for service calls for guarantee work. However, when service work is required to repair items damaged by neglect, misuse, or vandalism, costs shall be reimbursed to this Contractor.

E. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Package Sound System

1. Game Room

C. Definitions:

1. Auxiliary Input: The auxiliary inputs provide a means for the public address system user to use miscellaneous sound production equipment (boombox, phonograph, CD player, etc.) that has an output in the range of .1 - 1 volt.
2. Auxiliary Output: The purpose of the auxiliary output is to provide a sound system output to a device which has a sound recording system or another sound input system such as a part of a video/audio input cart to have a clean signal direct from the public address system.
3. AR: As required. As determined by site conditions, manufacturer's recommendations by system installer, and as shown on the drawings or as specified herein.

2.2 MAIN LIMITER/EQ LOUDSPEAKER PROCESSOR

A. Manufacturers:

1. Biamp Nexia CS 10x6 Digital signal processor
2. Biamp Volume 8 to be rack mounted next to the dual RCA jack

2.3 MIXER

A. Biamp Nexia CS as listed above.

2.4 POWER AMPLIFIERS

A. The amplifier shall have an electronic protection circuit as a safeguard against damage caused by overloads or shorted output. Approved and tested under U.L. standards 1711, 1480 and 813.

B. Manufacturer: The following equipment and manufacturers are representative of the type of equipment required. Size the amplifier as appropriate.

C. Manufacturer:

1. QSC ISA 800TI or equal

D. Provide power amplifiers as required to provide total headroom of at least 25% for the system.

2.5 LOUD SPEAKERS (COAX)

A. Manufacturer:

1. Hanging Speakers:

a. Sound Tube CM800D
b. Mounting Hardware

B. Provide all necessary mounting hardware.

2.6 MEDIA PLAYER

A. Manufacturer: Denon DN-300ZB Media Player with Bluetooth.

2.7 WIRELESS MICROPHONE

A. Provide wireless microphone as indicated in equipment list.

B. Wireless Lapel Microphone.

1. Manufacturers: Shure PGXD14/85 with rack mount kit

C. Wireless Handheld Microphone.

1. Manufacturers: Shure PGXD24/Beta58 with rack mount kit

2.8 ENCLOSURES

A. Wall-Rack.

1. The equipment shall be housed in a vertical rack which shall have 34 inches of panel space. The unit shall be constructed of 16 gauge steel with panel mounting rails of 14 gauge. All joining steel must be welded and bonded to form a sturdy, solid assembly. Use of lighter gauge steel and bolted-type construction does not provide the rigidity desired and, thus, it is not acceptable.
2. Manufacturer:

a. Lowell LWR-1623 Equipment Rack Provide with:

1) Lowell ACS-1512 Power Strip
2) Lowell Drawer UDE-314
3) Lowell US-314 Shelf
4) Lowell SG6P-3 Punched panel for Volume-8 and Dual RCA plate

5) Lowell LFD-16P Plexiglass Front Door

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Verify proper power connections are installed.

D. Proceed with installation only after unsatisfactory conditions are corrected.

E. All wiring shall test free from grounds and shorts.

F. Complete system shall be installed per manufacturer's recommendations and all applicable codes.

G. Provide equipment as follows:

Description	Game Room
Biamp Nexia CS with Volume 8	1
Power Amplifier	AR
Loud Speakers	AR
Wireless Handheld Microphone	1
Wireless Lapel Microphone	1
Media Player	1
Enclosure	1

H. Where x's are shown in boxes, provide that component. Where AR is shown in the box, provide quantity as required and as shown on floor plans. Where specific quantity is shown in box, provide that quantity of device.

I. Systems to be programmed to all of the Wireless Microphones and Media Player to be shared between both the Café Sound System and the Courtyard Sound system

3.2 FIELD MEASUREMENTS

A. Mounting heights as shown on drawings and details. Coordinate final locations with on-site architect prior to rough-in.

3.3 DELIVERY, STORAGE & HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment, and written notice received by ESC from Architect stating that these conditions exist at building site.
4. Install power supplies as required based on equipment per manufacturer. Coordinate power requirements, rough-in, and location with electrical contractor.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Raceways

1. All 120 volt wiring shall be in a conduit system separate from other building wiring.
2. All 120 volt wiring shall be in minimum ¾" steel raceway. Below floors to be rigid steel conduit.
3. All screws used for anchoring conduit and J-boxes parts in public or resident areas shall have tamperproof screws.
4. All screws used on signal devices, including speakers, shall be of the tamperproof type.
5. There shall be no sharp edges with installed materials.

D. Cable

1. Cable type, all speaker wiring to be WPW 25226 or equal, all microphone and aux jacks to be WPW 25292 or equal and wiring to Volume 8 to be manufacture recommended cable. Vendor to verify exact cable required based on the equipment and provide appropriate cable.
2. All cables to be plenum rated.
3. All wire runs shall be continuous lengths, without splices.
4. All wiring systems shall be color coded as shown on the drawings. Green conductors shall be used only for grounding conductors, white only for neutral conductors, and black shall be reserved for 120-volt line.

5. All control wiring systems shall use stranded copper conductors terminated with crimp connectors or lugs, correctly sized for the termination, and applied to the conductor with a crimping tool intended for use with the lug used, or to terminal strips providing 360 degree capture of the wire.
6. All field terminal blocks shall be 300 volts minimum NEMA rated, or as required by the NEC for the specific application, and be able to accommodate no less than two (2) #14 AWG wires.
7. Marker strips shall be attached to the field wiring. These markers shall not change when devices are replaced during repair or maintenance.
8. Within equipment cabinets, all wires and cables shall be contained in wire management channels such as Panduit or equal, and dressed and labeled in such a manner that all wires may be easily traced, and such that they do not obstruct access to components which may need to be replaced or serviced.
9. All low voltage cabling to be routed in J Hooks

E. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

    a. Each cabinet frame shall be grounded. Equipment cabinets shall be bonded directly to the building electrode grounding.
    b. All exterior panels of cabinets shall be bonded to the cabinet frame.
    c. All equipment installed in a cabinet shall be bonded to the cabinet frame.

F. Final Testing

1. The completed public address system shall be fully tested in accordance with NFPA by the Contractor in the presence of the Owner's representative and the Engineer. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner.
2. All wiring shall test free from all grounds and shorts.

G. Tests and Instructions

1. Checkout and final connections to the sound reinforcement system shall be made by a factory authorized representative of the products installed. In addition, the representative shall demonstrate operation of the complete system and each major component to the owner.
2. System field wiring diagrams shall be provided to this subcontractor by the system manufacturer prior to installation.
3. Upon completion of the installation, four (4) copies of complete operational instructions shall be furnished, complete with record drawings. Instructions shall include part numbers and names, addresses, and telephone numbers of parts source. Final payment shall not be made until operational and maintenance manuals have been received.
4. Upon completion of the installation of the equipment, the electrical contractor shall provide to the engineer a signed statement from the equipment supplier that the system has been wired, tested, and functions properly according to the specifications.

5. The conduit, outlets, terminal cabinets, etc., which form a part of the rough-in work shall be furnished and installed complete by the electrical contractor.
6. The balance of the system, including installation of the communications equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative, and the entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance by the Owner, shall be the responsibility of this subcontractor.
7. The vendor shall include in his cost, the cost of providing an 8 hour site visit during the second year of operation of the equipment. This equipment vendor shall furnish a credit memo to the school district for this 8 hour trip. It is understood that this credit memo covers a full 8 hours on site, in addition to any travel time or any other travel expenses.
8. All communication connections throughout the system shall be crimped by means of AMP lugs in all junction boxes. In terminal cabinets, all wiring shall be neatly laced, EZ code marked at both ends and terminated on Siemens 66M-50 punch blocks or approved equal.
9. Checkout and final connections to the communications system shall be made by a manufacturer's authorized representative for the products installed. In addition, the representative shall demonstrate operation of the complete system and each major component to the owner.
10. System field wiring diagrams shall be provided to the subcontractor by the system manufacturer prior to installation
11. Upon completion of the installation, four (4) copies of complete operational and maintenance instructions shall be furnished, complete with record drawings. Maintenance instructions shall include part numbers. Final payment shall not be made until operational and maintenance manuals have been received.
12. Upon completion of the installation, the electrical contractor shall provide to the engineer a signed statement from the equipment supplier that the system has been wired, tested, and functions properly according to the specifications.

3.5 OWNER TRAINING

A. Provide complete operator training for the Owner’s personnel.

B. Provide two (2) four hour training sessions on consecutive days at times set by the Owner. These should be scheduled as part of the Owner’s pre-occupancy transition training.

C. Provide a video tape training which can be used by the Owner for training new employees. This tape shall be carefully organized and segmented so that training may be given on the complete system, or on specific functions as may be appropriate.

D. Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

END OF SECTION 27 51 20

SECTION 27 51 21 HOSPITALITY AND LOUNGE AUDIO / VIDEO SYSTEM

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 – National Electric Code.

B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

C. Conform to current Telecommunication Industry Association (TIA/EIA).

D. Compliant with limits for Federal Communication Commission (FCC) Class B device.

E. Conform to current National Electrical Manufacturers Associates (NEMA) Standards.

1.3 DESCRIPTION OF WORK

A. Provide and install audio / video system consisting of concealed TV Display with lift mechanism, wall rack with sound system, Blu Ray player and HDMI connection.

B. All equipment will be located in a wall mounted rack and system controls shall be located at the reception as shown on the floor plan.

C. Furnish and install audio video system. Provide all material as indicated on the drawings and as specified herein, contractor to install dual RCA input connections in the equipment rack to be used as a music connection and HDMI connection and cables to be used as a video input source to the TV.

D. Contractor to wire the speakers in the lounge area separately to allow for independent volume control of the speakers located in the lounge

E. Contractor to provide Optical to Analog audio converter behind the TV with and Audio Cable from the TV into a sound system input. Sound System input to be programmed to allow any TV audio to be played through the sound system.

F. All necessary equipment required to meet the intent of these specifications, whether or not listed within these specifications, shall be supplied and installed to provide a complete and operational system.

G. Furnish and install all head-end equipment and all field equipment. Furnish and install all low voltage cabling required for a complete and operating system.

H. See Specification 26 05 01 for alternate information.

1.4 RELATED WORK ELSEWHERE

A. Division 26 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. All drawings must be in CADD format.
5. Block diagram indicating major system components and their relationship with other components.
6. A complete riser diagram indicating all head-end and other components with wire type and wiring diagrams.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the items listed above.

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. Provide copy of written warranty.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

1.8 WARRANTY

A. The supporting devices shall be warranted for a period of not less than 1 year from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, and repair parts cost.

C. Submit a written warranty executed by the installer agreeing to repair or replace any equipment that fails within the warranty period

D. During the guarantee period there shall be no charges to the Owner for service calls for guarantee work. However, when service work is required to repair items damaged by neglect, misuse, or vandalism, costs shall be reimbursed to this Contractor.

E. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Package Sound System

1. Hospitality and Lounge

C. Definitions:

1. Auxiliary Input: The auxiliary inputs provide a means for the public address system user to use miscellaneous sound production equipment (boombox, phonograph, CD player, etc.) that has an output in the range of .1 - 1 volt.
2. Auxiliary Output: The purpose of the auxiliary output is to provide a sound system output to a device which has a sound recording system or another sound input system such as a part of a video/audio input cart to have a clean signal direct from the public address system.
3. AR: As required. As determined by site conditions, manufacturer's recommendations by system installer, and as shown on the drawings or as specified herein.

2.2 MAIN LIMITER/EQ LOUDSPEAKER PROCESSOR

A. Manufacturers:

1. Biamp Nexia CS 10x6 Digital signal processor
2. Biamp Volume 8 to be rack mounted next to the dual RCA jack

2.3 MIXER

A. Biamp Nexia CS as listed above.

2.4 POWER AMPLIFIERS

A. The amplifier shall have an electronic protection circuit as a safeguard against damage caused by overloads or shorted output. Approved and tested under U.L. standards 1711, 1480 and 813.

B. Manufacturer: The following equipment and manufacturers are representative of the type of equipment required. Size the amplifier as appropriate.

C. Manufacturer:

1. QSC ISA 800TI or equal

D. Provide power amplifiers as required to provide total headroom of at least 25% for the system.

2.5 LOUD SPEAKERS (COAX)

A. Manufacturer:

1. Hanging Speakers:

a. Sound Tube CM800D
b. Mounting Hardware

B. Provide all necessary mounting hardware.

2.6 MEDIA PLAYER

A. Manufacturer: Denon DN-300ZB Media Player with Bluetooth.

2.7 WIRELESS MICROPHONE

A. Provide wireless microphone as indicated in equipment list.

B. Wireless Lapel Microphone.

1. Manufacturers: Shure PGXD14/85 with rack mount kit

C. Wireless Handheld Microphone.

1. Manufacturers: Shure PGXD24/Beta58 with rack mount kit

2.8 SOUND ENHANCEMENT SYSTEM FOR THE HEARING IMPAIRED

A. The hearing assistance system shall be an FM wireless system for use by the hearing impaired. The system shall consist of a rack mounted transmitter, with a field strength of 8000 vU/M at 30m. Frequency tolerance + .005%, maximum deviation + 75 kHz, S/N ratio 55dB, and Pre-Emphasis 75uS. The input connection shall be line level 0.03 to 1V rms nominal. The unit shall have an external antenna. The receiver unit shall be battery operated with a mini earphone. The unit shall use standard 9 volt batteries, have on/off/volume thumbwheel, and have a 250 mw output into 8 ohms. The receiver units shall be stored in multiple battery case that both charges and stores the receiver units.

B. Provide one rack mounted transmitter with remote wall mounted antenna. Provide wire guard for antenna mounted in gymnasium. The antenna may be rack mounted if system strength is adequate for proper operation.

C. Work with manufacturer of system to provide antenna mounting. This may require remote antenna mounted high on wall above enclosure.

D. Manufacturers:

1. Telex SM-2 or equal Kit Consisting of:

a. 1 – Transmitter
b. 4 – SR-50 Receivers
c. 4 – SEB-1 Earbuds
d. 4 – Telex or NL4S Neck Loop.

2.9 ENCLOSURES

A. Wall-Rack

1. The equipment shall be housed in a vertical rack which shall have 48 inches of panel space. The unit shall be constructed of 16 gauge steel with panel mounting rails of 14 gauge. All joining steel must be welded and bonded to form a sturdy, solid assembly. Use of lighter gauge steel and bolted-type construction does not provide the rigidity desired and, thus, it is not acceptable.
2. Manufacturer:

a. Lowell LWR-2423 Equipment Rack Provide with:

1) Lowell ACS-1512 Power Strip
2) Lowell Drawer UDE-314
3) Lowell US-314 Shelf Quantity 2
4) Lowell SG6P-3 Punched panel for Volume-8, Dual RCA plate and HDMI plate
5) Lowell LFD-24P Plexiglass Front Door

2.10 VIDEO

A. TV / Display

1. Provide and install Samsung UN70TU6980FXZA, 70” 4K TV
2. Provide and install all necessary mounting hardware to mount TV to ceiling lift

B. Lift Mechanism

1. Provide and install Auton DFD-200 Motorized Lift for 70” TV

C. Blu-Ray

1. Provide and install Samsung UDB-K8500 Blue Ray Player with HDMI cable from Blu-Ray player to TV

D. HDMI Connection

1. Contractor to provide and install HDMI Connection plate in the Audio/Video Rack with HDMI cable from the Rack to the TV

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Verify proper power connections are installed.

D. Proceed with installation only after unsatisfactory conditions are corrected.

E. All wiring shall test free from grounds and shorts.

F. Complete system shall be installed per manufacturer’s recommendations and all applicable codes.

G. Provide equipment as follows:

Description	Hospitality and Lounge
Biamp Nexia CS with Volume 8	1
Power Amplifier	AR
Loud Speakers	AR
Wireless Handheld Microphone	1
Wireless Lapel Microphone	1
Media Player	1

Description	Hospitality and Lounge
Enclosure	1
70” TV / Display	1
Motorized Lift	1
Blu-Ray Player	1
HDMI Connection Plate	1

H. Where x’s are shown in boxes, provide that component. Where AR is shown in the box, provide quantity as required and as shown on floor plans. Where specific quantity is shown in box, provide that quantity of device.

I. Systems to be programmed to all of the Wireless Microphones and Media Player to be shared between both the Café Sound System and the Courtyard Sound system

3.2 FIELD MEASUREMENTS

A. Mounting heights as shown on drawings and details. Coordinate final locations with on-site architect prior to rough-in.

3.3 DELIVERY, STORAGE & HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer’s recommendations.
2. Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer’s recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment, and written notice received by ESC from Architect stating that these conditions exist at building site.
4. Install power supplies as required based on equipment per manufacturer. Coordinate power requirements, rough-in, and location with electrical contractor.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in “factory new” condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Raceways

1. All 120 volt wiring shall be in a conduit system separate from other building wiring.
2. All 120 volt wiring shall be in minimum ¾” steel raceway. Below floors to be rigid steel conduit.
3. All screws used for anchoring conduit and J-boxes parts in public or resident areas shall have tamperproof screws.
4. All screws used on signal devices, including speakers, shall be of the tamperproof type.
5. There shall be no sharp edges with installed materials.

D. Cable

1. Cable type, all speaker wiring to be WPW 25226 or equal, all microphone and aux jacks to be WPW 25292 or equal and wiring to Volume 8 to be manufacture recommended cable. Vendor to verify exact cable required based on the equipment and provide appropriate cable.
2. All cables to be plenum rated.
3. All wire runs shall be continuous lengths, without splices.
4. All wiring systems shall be color coded as shown on the drawings. Green conductors shall be used only for grounding conductors, white only for neutral conductors, and black shall be reserved for 120-volt line.
5. All control wiring systems shall use stranded copper conductors terminated with crimp connectors or lugs, correctly sized for the termination, and applied to the conductor with a crimping tool intended for use with the lug used, or to terminal strips providing 360 degree capture of the wire.
6. All field terminal blocks shall be 300 volts minimum NEMA rated, or as required by the NEC for the specific application, and be able to accommodate no less than two (2) #14 AWG wires.
7. Marker strips shall be attached to the field wiring. These markers shall not change when devices are replaced during repair or maintenance.
8. Within equipment cabinets, all wires and cables shall be contained in wire management channels such as Panduit or equal, and dressed and labeled in such a manner that all wires may be easily traced, and such that they do not obstruct access to components which may need to be replaced or serviced.
9. All low voltage cabling to be routed in J Hooks

E. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier’s recommendations.

a. Each cabinet frame shall be grounded. Equipment cabinets shall be bonded directly to the building electrode grounding.
b. All exterior panels of cabinets shall be bonded to the cabinet frame.
c. All equipment installed in a cabinet shall be bonded to the cabinet frame.

F. Final Testing

1. The completed public address system shall be fully tested in accordance with NFPA by the Contractor in the presence of the Owner's representative and the Engineer. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner.
2. All wiring shall test free from all grounds and shorts.

G. Tests and Instructions

1. Checkout and final connections to the sound reinforcement system shall be made by a factory authorized representative of the products installed. In addition, the representative shall demonstrate operation of the complete system and each major component to the owner.
2. System field wiring diagrams shall be provided to this subcontractor by the system manufacturer prior to installation.
3. Upon completion of the installation, four (4) copies of complete operational instructions shall be furnished, complete with record drawings. Instructions shall include part numbers and names, addresses, and telephone numbers of parts source. Final payment shall not be made until operational and maintenance manuals have been received.
4. Upon completion of the installation of the equipment, the electrical contractor shall provide to the engineer a signed statement from the equipment supplier that the system has been wired, tested, and functions properly according to the specifications.
5. The conduit, outlets, terminal cabinets, etc., which form a part of the rough-in work shall be furnished and installed complete by the electrical contractor.
6. The balance of the system, including installation of the communications equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative, and the entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance by the Owner, shall be the responsibility of this subcontractor.
7. The vendor shall include in his cost, the cost of providing an 8 hour site visit during the second year of operation of the equipment. This equipment vendor shall furnish a credit memo to the school district for this 8 hour trip. It is understood that this credit memo covers a full 8 hours on site, in addition to any travel time or any other travel expenses.
8. All communication connections throughout the system shall be crimped by means of AMP lugs in all junction boxes. In terminal cabinets, all wiring shall be neatly laced, EZ code marked at both ends and terminated on Siemens 66M-50 punch blocks or approved equal.
9. Checkout and final connections to the communications system shall be made by a manufacturer's authorized representative for the products installed. In addition, the representative shall demonstrate operation of the complete system and each major component to the owner.

10. System field wiring diagrams shall be provided to the subcontractor by the system manufacturer prior to installation
11. Upon completion of the installation, four (4) copies of complete operational and maintenance instructions shall be furnished, complete with record drawings. Maintenance instructions shall include part numbers. Final payment shall not be made until operational and maintenance manuals have been received.
12. Upon completion of the installation, the electrical contractor shall provide to the engineer a signed statement from the equipment supplier that the system has been wired, tested, and functions properly according to the specifications.

3.5 OWNER TRAINING

A. Provide complete operator training for the Owner's personnel.

B. Provide two (2) four hour training sessions on consecutive days at times set by the Owner. These should be scheduled as part of the Owner's pre-occupancy transition training.

C. Provide a video tape training which can be used by the Owner for training new employees. This tape shall be carefully organized and segmented so that training may be given on the complete system, or on specific functions as may be appropriate.

D. Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

END OF SECTION 27 51 21

SECTION 27 51 24 - PAGING SYSTEM

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 – National Electric Code.

B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

C. Conform to current Telecommunication Industry Association (TIA/EIA).

D. Compliant with limits for Federal Communication Commission (FCC) Class B device.

E. Conform to current National Electrical Manufacturers Associates (NEMA) Standards.

F. UL Listing - All material and equipment shall be listed, labeled, or certified by Underwriters Laboratories, Inc. The intercom/paging system shall be UL 813 listed as a complete system. All power supplies and computers shall be UL listed. Provide UL listing cards for all components specified herein.

1.3 DESCRIPTION OF WORK

A. The paging system will consist of all speakers, wiring, mixer amplifier and page adaptor located in the data closet. The paging interface device to allow for phone connection. Provide a rack mounted shelf to mount the Valcom paging interface device in data rack. This system to allow for a data input from the owner’s phone system to allow for speaker annunciation all page thru owner furnished phone system. Furnish and install a complete and operable intercommunications system as indicated on the drawings and as specified herein.

B. One paging zone base bid

C. Provide an alternate add to the base bid to furnish and install a IP two way intercom system with two way talk back analog speakers in lieu of the base bid one way system.

D. System Inputs to Consist of: Input 1 – Phone System Paging, Input 2 —Customer provided music source

E. Paging System vendor shall include in bid time to coordinate all work with owner to interface the paging system to the owner’s phone system.

F. All necessary equipment required to meet the intent of these specifications, whether or not listed within these specifications, shall be supplied and installed to provide a complete and operational system.

1.4 RELATED WORK ELSEWHERE

A. Division 26 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Division 1.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. All drawings must be in CADD format.
4. Block diagram indicating major system components and their relationship with other components.
5. A complete riser diagram indicating all head-end and other components with wire type and wiring diagrams.

C. Submit cut sheets as outlined in Division 1 and include system riser diagram, all wire, devices, and provide written confirmation from the factory that they are an authorized representative for the submitted product. This document shall be included as part of the submittal data.

D. Provide complete brochure information on all components and accessory equipment. All information shall be clearly marked to indicate items provided.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Division 1.

B. The following information shall be submitted in addition to the items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Provide copy of written warranty.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Division 1.

B. The following shall be provided in addition to items listed above.

1. Arrange pre-installation meeting.
2. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
3. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
4. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation. Report results in writing.
5. Manufacturer must carry replacement parts.

1.8 WARRANTY

A. The supporting devices shall be warranted for a period of not less than 1 year from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, and repair parts cost.

C. Submit a written warranty executed by the installer agreeing to repair or replace any paging equipment that fails within the warranty period.

D. During the guarantee period there shall be no charges to the Owner for service calls for guarantee work. However, when service work is required to repair items damaged by neglect, misuse, or vandalism, costs shall be reimbursed to this Contractor.

E. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

F. Guarantee his work and equipment for a period of one year from date of acceptance of project by the Owner. Neither the final payment, nor any provisions in contract documents shall relieve this Contractor of the responsibility for faulty materials and/or workmanship for a period of one year. Remedy any defects due thereto, and pay for any damage to other work resulting therefrom.

G. Employ factory trained technical service personnel for service and maintenance of the system should service be required.

H. Carefully instruct the Owner's technical personnel in the operation, care and maintenance of the system.

I. It shall be possible for the Owner's technical personnel to attend Service and Maintenance Seminars conducted by the systems manufacturer to educate them in the technical aspects of the system.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Provide a complete and fully functional paging system using materials and equipment of types, sizes, and rating as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer’s standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions. Provide all accessories necessary for a fully functioning system.

C. Definitions

1. Where the word "Provide" is used, it shall be defined as requiring the furnishing and installing of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically noted.

D. Intercom Features

1. Interface with owners phone system

E. Scope of Work

1. Furnishing of all labor, superintendence, materials, tools, equipment and sources necessary for the complete installation.
2. Furnish and install a system complete in every respect and ready to operate. All miscellaneous items and accessories required for such installation whether or not each such item or accessory is shown on the plans or mentioned in these specifications shall be furnished and installed. The architectural, structural, mechanical and electrical drawings and specifications are included in this division in that they establish requirements and limitations of work to be performed under this section.
3. It shall be the responsibility of each bidder to examine the plans and specifications carefully before submitting his bid, with particular attention to errors, omissions and conflicts between plans and specifications. Any such discrepancy discovered shall be brought to the attention of the Engineer and will be included in the Base Bid.

F. Qualified Contractor

1. All systems herein specified shall be provided by a single source, installed equipment by an Authorized Factory Distributor for the equipment (not an Electrical Contractor), shall stock spare parts and maintain a staff of trained, certified technicians. A minimum of five years experience in the application of equipment is required.

2.2 MIXER AMPLIFIER

A. Manufacture

1. Lowell MA125 or equal / 5 channel 125 Watts

2.3 AUDIO PAGING EQUIPMENT

A. Paging Interface

1. Provide Valcom VIP-204A with rack mount kit

2.4 VOLUME CONTROLS

A. Provide Lowell 25LVC-S* volume control, confirm color with owner

2.5 INTERCOM COMMUNICATIONS SYSTEM

A. Intercom Field Hardware

1. Loudspeakers shall be eight inch seamless cone type. The ceramic magnet shall weigh at least 4.8 ounces. The frequency range shall be from 90 to 15,000 Hz. The normal wattage rating shall be 8 watts with a program rating of 12 watts. The voice coil diameter shall be 3/4" and the impedance 8 ohms. The loudspeaker shall be equipped with a universal matching transformer suitable for use on a 25-volt output line with taps at 1/2, 1, 2 or 4 watts.
2. Type 1: Flush Mount Ceiling Speakers Quam Solution 1
3. Type 3: Surface Mount Ceiling or Wall Speaker Quam System 1

2.6 WIRE AND CABLE

A. The speaker cable shall be a UL listed 18 AWG stranded copper conductor with plenum rated insulation. Each cable shall have 2 twisted conductors shielded with an aluminum mylar tape shielded material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Verify proper power connections are installed.

D. Proceed with installation only after unsatisfactory conditions are corrected.

E. All wiring shall test free from grounds and shorts.

3.2 FIELD MEASUREMENTS

A. Field verify surfaces where intercom equipment will be located. Verify adequate room for recessed equipment. Adjust locations to satisfy field measurements.

B. Mounting heights as shown on drawings and details. Coordinate final locations with on-site architect prior to rough-in.

3.3 DELIVERY, STORAGE & HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer’s recommendations.
2. Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer’s recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Mount all equipment except portable equipment firmly in place. Clearly, logically and permanently mark all switches, jacks and receptacles.

B. Cable Installation

1. Install all equipment per manufacturer's instructions and directions.
2. In areas where cable trays are not used for cable installation, a "J-hook" support system shall be used throughout. Maximum spacing between support hooks shall be 3' on center. Cables shall not be installed in a hap-hazard manner across the ceiling grid system. The following method shall be used:

a. Conduits acting as cable raceways that are stubbed into the accessible ceiling space shall be extended into the nearest corridor space, or, as an option, the contractor shall install a sleeve through any wall separating the room from the corridor area.
   Cables shall be routed at 90 degrees from the room to the support system in the corridor. In the event that there is not adequate corridor space, the support system may be moved into the adjacent rooms. Make modifications, as necessary, in the support system to minimize cable lengths.
b. J-hook system shall be installed in straight lines perpendicular, right angle to the building walls. Groups of J-hooks shall be used where the single bridal ring system is not adequate to support the cabling.
c. The support system shall be used up to the conduits that feed the cables into the outlet or cable distribution points. Mark the record drawings to indicate the approximate path of the support system.
d. Mark the "record drawings" to indicate the approximate path of the J-hook system.

3. Provide and install all wall sleeves and penetrations. Any place that a wall is penetrated to route cable through the wall, provide a through-the-wall sleeve. This may be PVC conduit in those areas where plenum cable is not used. It shall be steel conduit with insulated connectors on ends in those areas where plenum ceilings are used. For each door entering each room, include in pricing, the cost of providing and installing one sleeve above all doors entering rooms. These sleeves shall be installed above the ceiling grid.
4. In those areas where there is not an accessible ceiling, all system cables shall be routed through conduit, through the non-ceiling area, into an area where there is ceiling cavity. There shall be no open cables routed through ceiling areas, unless it is indicated otherwise on the drawings.

C. Wiring

1. Provide conduit systems to accessible spaces only and mount all boxes for the systems wiring. Special boxes (i.e. speaker boxes, amplifier boxes, etc.) as shown on the project drawings shall be provided by the systems contractor for installation by the Electrical Contractor.
2. It shall be the responsibility of the systems contractor to furnish and install all wire and cable for the system.

D. Cleaning

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in “factory new” condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

E. Raceways

1. All screws used for anchoring conduit and J-boxes parts in public or resident areas shall have tamperproof screws.
2. All screws used on signal devices, including speakers, shall be of the tamperproof type.
3. There shall be no sharp edges with installed materials.

F. Cable

1. Vendor to verify exact cable required based on the equipment and provide appropriate cable.
2. All cables to be plenum rated.
3. All wire runs shall be continuous lengths, without splices.
4. All wiring systems shall be color coded as shown on the drawings. Green conductors shall be used only for grounding conductors, white only for neutral conductors and black shall be reserved for 120-volt line.
5. All control wiring systems shall use stranded copper conductors terminated with crimp connectors or lugs, correctly sized for the termination, and applied to the conductor with a crimping tool intended for use with the lug used, or to terminal strips providing 360 degree capture of the wire.
6. Marker strips shall be attached to the field wiring. These markers shall not change when devices are replaced during repair or maintenance.
7. Within equipment cabinets, all wires and cables shall be contained in wire management channels such as Panduit or equal, and dressed and labeled in such a manner that all wires may be easily traced, and such that they do not obstruct access to components which may need to be replaced or serviced.
8. All low voltage cabling to be routed in “D” rings or in cable tray.

G. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier’s recommendations.

    a. Each cabinet frame shall be grounded. Equipment cabinets shall be bonded directly to the building electrode grounding.
    b. All exterior panels of cabinets shall be bonded to the cabinet frame.
    c. All equipment installed in a cabinet shall be bonded to the cabinet frame.

H. On Site Programming

1. The system supplier shall provide on-site programming. He shall program the unit in conjunction with the owner's requirements. The systems supplier shall plan on spending a minimum of one day on site with the owner to provide all programming for the system.

I. Final Testing

1. The completed intercom system shall be fully tested in accordance with NFPA by the Contractor in the presence of the Owner's representative and the Engineer. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner.
2. All wiring shall test free from all grounds and shorts.
3. Upon completion of the installation, the system must be tested by the manufacturer's representative and all necessary modifications and/or adjustments must be made to assure compliance with this specification.
4. Upon completion of the testing, the manufacturer or his representative shall issue to the Owner a letter of certification attesting to the fact that he has tested and adjusted the system, that all components are properly installed and free of defects, and that the system is in compliance with this specification.

3.5 OWNER TRAINING

A. Provide complete operator training for the Owner's personnel.

B. Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

C. The work shall include supplying the services of a field service representative who shall be a full-time employee. The field service representative shall have specialized experience in the operation and maintenance of the system and shall instruct the Owner's personnel in the techniques involved in the operation of the systems. A formal on-site training shall be provided by this contractor to the owners representative/maintenance personnel and shall include instructions in the location, inspection, maintenance, testing and operation of all electronic components. Provide a minimum of two hours of general instruction. Provide a signed copy of the name of the personnel giving the instructions and the personnel of the Owner.

D. Diagrams, Drawings and Instruction Manuals

1. Furnish bound instruction manuals for the complete system for the Owner's use.
2. Manuals shall include instructions, block and schematic diagrams, wiring diagrams, specification and technical data of the components, and "as-built" drawings of the completed system.

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 27 51 24

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SECTION 28 23 00 - SECURITY CAMERA SYSTEM

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 – National Electric Code.

B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

C. Conform to current Telecommunication Industry Association (TIA/EIA).

D. Conform to current National Electrical Manufacturers Associates (NEMA) Standards.

1.3 DESCRIPTION OF WORK

A. Provide Digital Watchdog platform for CCTV system. One possible Vendor:

JSM Secure, Inc
Ray Maze, Security Consultant
N5764 County Road TT
Sheboygan Falls, WI 53085
Office: 920-467-7550
Cell: 920-627-7120
Email: ray@jsmcom.com

B. Furnish and install a full IP camera system, including but not limited to all cameras, licensing, aiming and integration/ programming POE and switches. The IP camera system shall be set up to allow viewing and playback of all video from any network connected computer or through a network connection. All POE ports and IP addresses to be furnished and installed by this vendor. Vendor to work with owner to provide appropriate lenses and exact location of each camera prior to installation.

C. POE switches by owner to be mounted in data racks. Data cabling, jumper cables and patch panels will be furnished and installed by the data contractor

D. Schedule a pre-installation meeting with the Owner. Provide demo unit to demonstrate camera operation and overall operation of system. This meeting is to take place and any changes be made to the specified system prior to final shop drawing submittal. The selected vendor will meet with staff and make any final recommendations on exact camera placement and configuration for each individual site. The exact camera placement must be verified on site and the viewing area shown to and agreed upon by the owner. The camera locations may be moved from the locations shown on the plans up to 25' to provide the best location based on field conditions and mounting options. Camera location must be finalized prior to final data cabling and raceway installation. The cost of this meeting and development time to be included in bid.

E. All necessary equipment required to meet the intent of these specifications, whether or not listed within these specifications, shall be supplied and installed to provide a complete and operational system.

F. Furnish and install all low-voltage cabling required for a complete and operating system.

G. Division 26 contractor include cost of division 28 in their bid.

1.4 RELATED WORK ELSEWHERE

A. Divisions 26, 27, and 28.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. All drawings must be in CADD format.
4. Block diagram indicating major system components and their relationship with other components.
5. A complete riser diagram indicating all head-end and other components with wire type and wiring diagrams.
6. Color sample in 2" x 2" format of camera housing color.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.

2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Provide copy of written warranty.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. The following shall be provided in addition to items listed above.

1. Arrange pre-installation meeting.
2. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
3. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful in-service performance.
4. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation. Report results in writing.
5. Manufacturer must carry replacement parts.

1.8 WARRANTY

A. The supporting devices and labor for installation shall be warranted for a period of not less than 1 year from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, and repair parts cost.

C. Submit a written warranty executed by the installer agreeing to repair or replace any security camera equipment that fails within the warranty period.

D. Due to the sensitive nature of this type of equipment, the Contractor agrees that warranty service shall be completed promptly, and that where necessary, premium freight (i.e. Fed-Ex or equal) will be used to obtain replacement parts. Service response requirements shall include the following:

1. Twenty-four (24) hour phone number.
2. Ability to restore functionality within eight (8) hours after notification on a twenty-four (24) hour basis.

E. During the guarantee period there shall be no charges to the Owner for service calls for guarantee work. However, when service work is required to repair items damaged by neglect, misuse, or vandalism, costs shall be reimbursed to this Contractor.

F. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Provide a complete and fully functional security camera system using materials and equipment of types, sizes, and rating as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions. Provide all accessories necessary for a fully functioning system.

2.2 SYSTEM COMPONENTS

A. Server

1. !8Tb Server

B. POE switches

1. By owner

C. Video Management Software

1. Furnished and installed by CCTV vendor Division 28.
2. Digital Watchdog software. No other VMS will be accepted.
3. Provide latest software release available.
4. All licensing fees included in cost of system

D. Camera Type : Indoor Cameras single dome

1. Arecont AV02CID100 vari focus lens and remote focus zoom
2. Provide recessed or surface dome depending on location
3. 4MP CAMERA 2.8MM
4. Provide dome and housing, arms and caps as called out on plans
5. Provide quantity of lenses in each camera as shown on plans. Multiple lensed cameras will be required in some locations as shown.

E. Camera Type : Indoor Cameras Dual dome

1. Arecont xxxxx vari focus lens and remote focus zoom
2. Provide recessed or surface dome depending on location
3. 4MP camera 2.8mm
4. Provide dome and housing, arms and caps as called out on plans

F. Camera Type: Indoor/Outdoor Dome 4 Camera adjustable dome 360

1. Arecont Vision SurroundVideo® Omni Cameras:

a. Av20375RD

G. Camera Type: Outdoor

1. Arecont AV05CLB-100 5 Megapixel (MP) H.265/H.264 All-in-One Motorized P-Iris Lens True Day/Night Indoor/Outdoor Dome IP Cameras with SNAPstrem+™ (Smart Noise Adaptation and Processing), Enhanced WDR™ (Wide Dynamic Range), NightView™, and Smart IR. This camera doe need an AV-JBA-W mounting box.

H. General

1. Furnish and install appropriate arm, corner recessed, and surface mounted equipment based on site conditions.
2. Provide initial camera licensing fees as part of bid.

2.3 SOFTWARE

A. Provide software to allow for all cameras specified and allow district to network buildings.

2.4 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Proceed with installation only after unsatisfactory conditions are corrected.

2.5 FIELD MEASUREMENTS

A. Field verify proper aiming is done on all cameras.

B. Field verify proper camera lens is used to allow proper viewing.

C. Field verify surfaces where camera will be located. Verify adequate room for recessed equipment and viewing angles are unobstructed. Adjust locations to satisfy field measurements.

D. Mounting heights to be coordinated with on-site Owner’s rep prior to rough-in.

2.6 DELIVERY, STORAGE & HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

2.7 INSTALLATION

A. General:

1. Exact camera locations to be verified prior to final installation with owner, data cabling installer, and camera supplier present.
2. Appropriate mounting arms, hangers, and supports to be provided based on final locations selected, per manufacturer's requirements and site conditions.
3. Install all materials, assemblies, and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Raceways:

1. There shall be no sharp edges with installed materials.

D. Cable:

1. Cable type, size, and quantity to be as shown on drawings. Vendor to verify exact cable required based on the equipment and provide appropriate cable.
2. All cables to be plenum rated.
3. All wire runs shall be continuous lengths, without splices.
4. All low voltage cabling to be routed in "j" hooks or in cable tray.

E. Grounding:

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

F. Final Testing:

1. The completed security camera system shall be fully tested in accordance with all applicable codes by the Contractor in the presence of the Owner's representative and the Engineer. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner.
2. All wiring shall test free from all grounds and shorts.

G. The Owner reserves the right to have an equipment demonstration to test the functional operation of the system supplier's proposed equipment. System supplier will be notified of any demonstration dates and times. If such demonstrations are utilized, it will be the sole judgment of the owner and specifying authority to decide whether a contractor/manufacturer meets or exceeds the specification.

H. All demonstrated equipment must be that of a standard single manufacturer and meet the same required testing and conditions that are applicable to the manufactured equipment. Custom or modified equipment that is not of standard, current manufacture cannot be demonstrated.

I. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all state and local codes.

J. Contractor shall terminate all wiring with manufacturer-approved connectors.

K. Wiring shall be UL listed, NEC and NFPA 70, Article 25 approved.

L. All programming that is required for installation shall be done. Meet with the owner to determine if there are any extraordinary programming circumstances. The supplier shall go over the entire sequence of operation of the system and explain the various programming sequences.

M. Cable Support & Raceways:

1. In areas where cable trays are provided, cables shall be installed within the trays.
2. Above accessible ceilings, a "J-hook" support system shall be used throughout the ceiling space, other areas where cables are run. The "J" shall have flat bottoms to eliminate single point stress on cables supported. Cables shall not be installed in a hap-hazard manner across the ceiling grid system. The following method shall be used:

    a. Conduits that are stubbed into the accessible ceiling space that are acting as cable raceways shall be extended into the nearest corridor space, or, as an option, the contractor shall install a sleeve through any wall separating the room from the corridor area.
    b. Cables shall be routed at 90 degrees from the room to the J-hook support system in the corridor. The corridor area shall generally be defined as the area where the J-hook support system shall be installed. However, in the event that there is not adequate corridor space, the J-hook system may be moved into the adjacent rooms.

c. J-hook system shall be installed in straight lines perpendicular, right angle to the building walls. Groups of J-hooks shall be used where the single J-hook system is not adequate to support the cabling.
d. Mark the "record drawings" to indicate the approximate path of the J-hook system.
e. Maximum spacing between J-hooks or D-rings is to be 5'.

3. Provide and install all wall sleeves and penetrations. Any place that a wall is penetrated to route cable through the wall, the contractor shall provide a through-the-wall sleeve. It shall be steel conduit with insulated connectors on ends in those areas where plenum ceilings are used.
4. In those areas where there is not an existing ceiling, all system cables shall be routed through conduit, through the non-ceiling area, into an area where there is ceiling cavity. There shall be no open cables routed through ceiling areas, unless it is indicated otherwise on the drawings.

2.8 OWNER TRAINING

A. Provide complete operator training for the Owner’s personnel.

B. Provide two (2) two hour training sessions on consecutive days at times set by the Owner. These should be scheduled as part of the Owner’s pre-occupancy transition training.

C. Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

2.9 SPARE EQUIPMENT

A. Provide two mini dome cameras recessed

B. Provide two 4 position dome cameras

C. Provide Two exterior corner mount arms

END OF SECTION 28 23 00

SECTION 28 24 00 – ACCESS CONTROL

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 – National Electric Code.

B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

C. Conform to current Telecommunication Industry Association (TIA/EIA).

D. Conform to current National Electrical Manufacturers Associates (NEMA) Standards.

1.3 DESCRIPTION OF WORK

A. Furnish and install the card reader and door contact as indicated.

B. Furnish and install single-gang outlet box for keyless entry stations. Provide outlet box and conduit stub into accessible ceiling space. Install flush in wall at closest accessible location to door.

C. Furnish and install all low voltage cabling required for a complete and operating system.

D. All wiring associated with the door strikes for the main entry doors to be in raceway. All other wiring to be open type cabling and be installed in J-hooks with other data cabling.

E. This vendor to include in bid time for meeting with the city and construction manager to coordinate system installation and timing.

F. Components, equipment, programming, etc. shall be furnished and installed by system representative.

G. JSM contact:

JSM Secure, Inc
Ray Maze, Security Consultant
N5764 County Road TT
Sheboygan Falls, WI 53085
Office: 920-467-7550
Cell: 920-627-7120
Email: ray@jsmcom.com

1.4 RELATED WORK ELSEWHERE

A. Division 26 Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. All drawings must be in CADD format.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Provide copy of written warranty.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. The following shall be provided in addition to items listed above.

1. Arrange pre-installation meeting.
2. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
3. Manufacturer’s Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
4. Manufacturer must carry replacement parts.
5. All components must be UL Listed and be UL Listed as an assembled system.

1.8 WARRANTY

A. The supporting devices and labor for installation shall be warranted for a period of not less than 1 year from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, and repair parts cost.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Provide a complete and fully functional keyless entry system materials and equipment of types, sizes, and rating as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.

C. All system products by DMP no equals

2.2 HARDWARE

A. The quantities of components shall be determined and installed by the contractor based on the requirement to provide a fully operational integrated access control system as per the intent of the specification.

2.3 PANEL

A. DMP XR550 with virtual keypad software and programming.

B. Altronix Trove 2dm2

2.4 INTERFACE MODULE

A. DMP 734 Wiegand

2.5 CABLE

A. As shown on details

2.6 MULLION CARD READERS

A. 26bit Wiegand

2.7 DOOR CONTACT (DOOR POSITION SWITCH)

A. Honeywell recessed 3/4 947-75T

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Verify proper power connections are installed.

D. Proceed with installation only after unsatisfactory conditions are corrected.

E. All wiring shall test free from grounds and shorts.

3.2 FIELD MEASUREMENTS

A. Verify on site all wire lengths and exact location of devices.

B. Mounting heights:

1. As shown on drawings and details.
2. Coordinate exact heights with specific manufacturer's recommendations.
3. All mounting heights of keypads and pushbuttons to be ADA compliant.

3.3 DELIVERY, STORAGE & HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until detention areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in “factory new” condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Raceways:

1. All screws used for anchoring conduit and J-boxes parts in public or resident areas shall have tamperproof screws.
2. All screws used on signal devices, including speakers, shall be of the tamperproof type.
3. There shall be no sharp edges with installed materials.

D. Cable:

1. All wire runs shall be continuous lengths, without splices.
2. All wiring systems shall be color coded as shown on the drawings. Green conductors shall be used only for grounding conductors, white only for neutral conductors.
3. All control wiring systems shall use stranded copper conductors terminated with crimp connectors or lugs, correctly sized for the termination, and applied to the conductor with a crimping tool intended for use with the lug used, or to terminal strips providing 360 degree capture of the wire.
4. All field terminal blocks shall be 300 volts minimum NEMA rated, or as required by the NEC for the specific application and be able to accommodate no less than two (2) #14 AWG wires.
5. Marker strips shall be attached to the field wiring. These markers shall not change when devices are replaced during repair or maintenance.
6. Within equipment cabinets, all wires and cables shall be contained in wire management channels such as Panduit or equal, and dressed and labeled in such a manner that all wires may be easily traced, and such that they do not obstruct access to components which may need to be replaced or serviced.
7. All low voltage cabling to be routed in J hooks above lay-in ceilings for devices.
8. Plenum Rated

E. Grounding:

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier’s recommendations.

    a. Each cabinet frame shall be grounded. Equipment cabinets shall be bonded directly to the building electrode grounding.
    b. All exterior panels of cabinets shall be bonded to the cabinet frame.
    c. All equipment installed in a cabinet shall be bonded to the cabinet frame.

F. Cable Support & Raceways:

1. In areas where cable trays are provided, cables shall be installed within the trays.
2. Above accessible ceilings, a "J-hook" support system shall be used throughout the ceiling space, other areas where cables are run. The "J" shall have flat bottom to eliminate single point stress on cables supported Min size is cat 21. Allow for 50% spare capacity in all runs of J hooks. Provide additional runs where required to meet this requirement. Cables shall not be installed in a hap-hazard manner across the ceiling grid system. J-hooks to be separate from the data or fire alarm J hooks. J hook spacing to be a maximum of 5’ on center. J hooks to be run parallel to the data and fire alarm J hooks The following method shall be used:

    a. Conduits that are stubbed into the accessible ceiling space that are acting as cable raceways shall be extended into the nearest corridor space, or, as an option, the contractor shall install a sleeve through any wall separating the room from the corridor area.
    b. Cables shall be routed at 90 degrees from the room to the J-hook support system in the corridor. The corridor area shall generally be defined as the area where the J-hook support system shall be installed. However, in the event that there is not adequate corridor space, the J-hook system may be moved into the adjacent rooms.
    c. J-hook system shall be installed in straight lines perpendicular, right angle to the building walls. Groups of J-hooks shall be used where the single J-hook system is not adequate to support the cabling to allow for 50% spare capacity.
    d. Mark the "record drawings" to indicate the approximate path of the J-hook system.
    e. Maximum spacing between J-hooks to be 5'.

3. Provide and install all wall sleeves and penetrations. Any place that a wall is penetrated to route cable through the wall, the contractor shall provide a through-the-wall sleeve. It shall be steel conduit with insulated connectors on ends in those areas where plenum ceilings are used. For each door entering each room, include providing and installing one sleeve above all doors entering rooms. These sleeves shall be installed above the ceiling grid.
4. All system cables shall be routed through conduit, through the non-ceiling area, into an area where there is ceiling cavity. There shall be no open cables routed through ceiling areas, unless it is indicated otherwise on the drawings.

END OF SECTION 28 24 00

SECTION 28 31 10 – VOICE ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. NFPA 70 - National Electrical Code (NEC) Generally, and Article 760 in particular

B. NFPA-72 – National Fire Alarm Code

C. NFPA 101 - Life Safety Code

D. NFPA-90A - Installation of Air Conditioning and Ventilating Systems

E. State and Local Codes

F. National Electrical Manufacturer's Association (NEMA)

G. Underwriters' Laboratories, Inc. (UL)

1. UL-864 Control Units for Fire Protective Signaling Systems
2. UL-268 Smoke Detector for Fire Protective Signaling Systems
3. UL-217 Smoke Detectors for Single and Multiple Station
4. UL-521 Heat Detectors for Fire Protective Signaling Systems
5. UL-464 Audible Signaling Appliances
6. UL-1971 Visual Signaling Appliances
7. UL-38 Manually Actuated Signaling Boxes
8. UL-1481 Power Supplies for Fire Protective Signaling Systems

1.3 DESCRIPTION OF WORK

A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the new Fire Alarm System as shown on the drawings and as herein specified.

B. Furnish and install a complete Voice Multiplex/Intelligent Fire Alarm System as described herein and as shown on the plans; to be wired, connected, and left in first class operating condition.

C. The new fire alarm system shall be an intelligent/analog type, and shall consist of a single Main Fire Alarm Control Panel (FACP), and Fire Alarm Annunciator Panel(s) (FAAP), unless a different design is submitted and approved.

D. The new fire alarm system shall be configured as a remote station signaling system, as defined in NFPA-72, and shall use/incorporate the following features, as a minimum:

1. The latest intelligent analog, addressable technology (detectors/sensors and modular panel equipment) currently available from the manufacturer.
2. Speaker-type Audible Notification Appliances.
3. Signaling Line Circuits (SLCs), connecting addressable field points to the associated Fire Alarm Control Panel, shall be configured as NFPA style 4 (Class B), with point supervision.

    a. Isolated SLC Circuits, or circuit branches shall be provided, so that separate areas or floors are independently isolated (a single Short Circuit or Ground Fault, on the SLC wiring on any floor shall not affect the proper operation of the SLC serving any other floor).
    b. Floors with more than 25 Addressable Devices shall be split into isolated SLC sub-circuits where each circuit shall not have more 25 devices. Where this is done, the floor shall be "split" along a logical, physical boundary.

4. Network Connections, Data, Audio, and Signaling Line Circuits, which functionally link together multiple panels or Transponders shall be wired in an NFPA Style 6 (Class A) arrangement.
5. Initiating Device Circuits (IDCs) shall be limited to short runs from Monitor Modules to the connected device, unless specifically stated otherwise herein, and shall be configured as NFPA Style B (Class B), with individual zone supervision.
6. Notification Appliance Circuits (NACs) shall be configured as NFPA Style Y (Class "B"). Provide 25% spare capacity for future devices.
7. Data Circuits to Annunciators shall be configured as NFPA Style 4 (Class "B"). All annunciators shall be fully supervised.

E. Provide UL 864 listed dual dialer for remote monitoring. Dialer shall interface with Owner's monitoring company. Provide connection and test after installation. Provide one year monitoring service for fire alarm system. Contract period shall start at date of substantial completion. Coordinate dialing sequence with Owner.

F. The fire alarm system shall allow for loading and editing special instructions and operating sequences as required. The systems shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.

G. Within this specification, unless specifically noted otherwise, the term "detector" shall be used to refer to automatic fire detectors, which support either Analog Addressable or Intelligent Addressable detection technologies, as follows:

1. "Analog Addressable Sensor" technology – where the Sensors utilized within this system function as non-intelligent or semi-intelligent transducers, which report Analog Values to the FACP. Where this technology is employed, historical data and / or floating average values associated with each Sensor – such as the Average, Peak, and Current Obscuration Values, shall be maintained within the memory of the FACP. Where Analog Addressable Sensors are utilized, Alarm conditions shall be determined by the FACP based upon readings reported by the various Sensors.
2. "Intelligent Addressable Smoke Detector" technology – where the detectors utilized within this system function as intelligent detectors. These detectors shall contain processing and memory circuits within each detector unit. If desired, the Analog Smoke Obscuration Value at any such detector can be manually retrieved to the FACP for report or adjustment purposes. Where Intelligent Addressable Detectors are utilized, historical data and / or floating average values associated with each Sensor – such as the Average, Peak, and Current Obscuration Values, shall be maintained within the memory of detector itself. Where Intelligent Addressable Smoke Detectors are utilized, Alarm conditions shall be determined locally, at the detectors.

H. For purposes of this specification, analog addressable sensors and intelligent addressable detectors, as described above, shall be considered to be functionally equivalent.

1. In either case, non-addressable detectors shall be unacceptable, except at individual locations where specified – where ambient environmental values prevent use of addressable units.
2. Simple Addressable systems, which do not support Analog Addressable or Intelligent Addressable detection technology, shall also be unacceptable.

1.4 RELATED WORK ELSEWHERE

A. Division 26, 27, and 28 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. All drawings must be in CADD format.
4. Block diagram indicating major system components and their relationship with other components.
5. A complete riser diagram indicating all head-end and other components with wire type and wiring diagrams.

C. Submittal drawings:

1. Provide submittal drawings that are in compliance with State requirements for fire alarm system submittals. This shall include:

    a. Include all cost associated with submitting to the State for review.
    b. Battery calculations
    c. Voltage drop calculations for all signal lines
    d. Sequence of operation
    e. Wiring diagrams
    f. Floor plan layout of all fire alarm devices indicating candela levels on each individual signal.

2. These shall be used, per State requirements for fire alarm submittals. This information shall be included with each set of fire alarm shop drawings.
3. Provide each submittal booklet with a table of contents that includes all items in submittal, specifically it shall include the following. This page shall be a separate page to allow engineer's stamp for State submittal.

    a. Page listing for battery calculations.
    b. Page listing for voltage drop calculations for all signal lines.
    c. Page listing Sequence of Operation.
    d. Page listing catalog cut sheets.
    e. Page listing all other items that are included in the booklet.
    f. Full set of fire alarm drawings with fire alarm devices indicated and proper candela levels indicated on those devices. The electrical engineer will forward bid-set CAD drawings to contractor or supplier.

D. Riser diagram with wire sizes indicated shall be shown on floor plan drawings per State of WI requirements.

E. Provide one additional set of drawings and booklet along with three additional drawing cover sheets for State fire alarm review. State submittal must be approved before work is to begin.

F. Include all state fees and submittal cost as part of bid

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Complete front elevation drawing of equipment rack and exact component layout within rack.
4. Provide copy of written warranty.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. The following shall be provided in addition to items listed above.

1. Arrange pre-installation meeting.
2. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
3. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
4. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation. Report results in writing.
5. Manufacturer must carry replacement parts.

1.8 WARRANTY

A. The supporting devices shall be warranted for a period of not less than 1 year from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, and repair parts cost.

C. Submit a written warranty executed by the installer agreeing to repair or replace any fire alarm equipment that fails within the warranty period.

D. During the warranty period, provide the Owner with one update/revision of schedule definitions, i.e.:

1. Revise schedule of openings assigned to groups.
2. Revise functions allowed at openings as long as no hardware or wiring changes are required.
3. Provide one revision of the computer graphic displays (floor plans).

E. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

F. System Service Support

1. The system's vendor must employ factory trained technicians and maintain a service organization within 100 miles of the job site. This organization must have a minimum of 10 years experience servicing fire alarm systems and provide 24 hour emergency service.

PART 2 - PRODUCTS

2.1 GENERAL

A. The contractor shall provide a fire alarm system manufactured by:

1. Notifier Onyx NFS-640. No equals

B. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available.

C. Provide a complete and fully functional fire alarm system using materials and equipment of types, sizes, and rating as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions. Provide all accessories necessary for a fully functioning system.

D. Power Requirements

1. The fire alarm control panel and NAC shall receive 120 VAC power via a dedicated circuit.
2. All circuits requiring system operating power shall be 24 VDC and shall be individually fused at the control panel.
3. Provide supervised remote battery backed-up power supplies where required. Coordinate with contractor at bid to include 120 volt connection in bid.

E. Alarm Sequence

1. The system alarm operation subsequent to the alarm activation of any manual station, automatic detection device, or sprinkler flow switch is to be as follows:

a. All audible alarm indicating appliances shall sound until silenced by the alarm silence switch at the control panel.
b. Xenon strobes shall display a continuous pattern until system is reset.
c. All doors normally held open by door control devices shall release.
d. To accommodate and facilitate job site changes, the type of "city connection circuit" is to be on site configurable to provide a "reverse polarity", "local energy", "shunt" or dry contact connection.
e. The mechanical controls shall activate the air handling systems per life safety specification NFPA 101.

f. Upon reset of control panel, air handling units shall sequentially start up to reduce electrical demand.

2. The activation of any system smoke detector shall initiate an Alarm Verification operation whereby the panel will reset the activated detector and wait for a second alarm activation. If, within one minute after resetting, a second alarm is reported from the same or any other smoke detector, the system shall process the alarm as described previously. If no second alarm occurs within one minute, the system is to resume normal operation. The Alarm Verification is to operate only on smoke detector alarms. Other activated initiating devices shall be processed immediately. The alarm verification operation is to be U.L. listed.
3. The control panel is to have a dedicated system trouble LED and a dedicated trouble acknowledge switch.

a. Alarm Silencing:

1) Should the "Alarm Silence" button be pressed, all alarm signals shall cease operation.
2) Signals shall not be silenced during alarm silence inhibit mode.

b. System Reset:

1) The "System Reset" button shall be used to return to its normal state after an alarm condition has been remedied.
2) Should an alarm condition continue to exist, the system will remain in an abnormal state. System control relays shall not reset. The panel Priority Alarm LED shall remain on. These points will not require acknowledgement if they were previously acknowledged.

4. A manual evacuation switch shall be provided to operate the systems alarm notification appliances. Other control circuits shall not be activated. However, a fire alarm shall be processed as described previously.
5. Activation of an auxiliary bypass switch shall override the automatic functions either selectively or throughout the system.
6. Alarm and trouble conditions shall be immediately displayed on the control panel alphanumeric display. If more alarms or troubles are in the system, the operator may scroll to display new alarms.

F. Supervision

1. There shall be adequate independently supervised and independently fused notification appliance circuits for alarm, horns, and flashing alarm lamps. Disarrangement conditions of any circuit shall not affect the operation of other circuits.
2. All auxiliary manual controls shall be supervised so that all switches must be returned to the normal automatic position to clear system trouble.
3. Each independently supervised circuit shall include a discrete panel readout to indicate disarrangement condition per circuit.

4. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel and the remote annunciator.

G. One-Way Voice Communications Operation

1. The automatic voice evacuation sequence shall be as follows:

a. The audio alarm signal shall consist of an alarm tone for a maximum of 2 seconds followed by a temporal code-three. The temporal code-three shall sound until the alarm silence switch at the fire alarm control panel or the remote annunciator has been operated.
b. All audio alarm operations of speaker circuit selection and alarm tone timing variations shall be activated by the system software so that any required future changes to the evacuation sequence or re-arrangements of audio circuits can be facilitated by authorized personnel without any additional components or rewiring.
c. The system shall be configured to allow for "All Call" from both the main control panel and the designated remote annunciator panel(s).

2. All Call:

a. Upon the activation of the "All Call" switch, two (2) seconds of tone shall sound over all speakers in the system indicating an impending voice message will occur. At the end of this tone, the operator shall be able to make announcements via the push-to-talk paging microphone over all system speakers. Strobes shall flash in all areas or floors. Systems, which require more than one switch to perform this function activation, are not acceptable.
b. The system shall automatically default to the fire alarm operations if the microphone becomes inactive for more than one (1) minute.

3. All Call For IP Telephone System:

a. All call capabilities shall be provided to the owner’s IP telephone system.

2.2 ADDRESSABLE NETWORK OPERATION

A. Communication with addressable devices: The system must provide communication with all initiating and control devices individually. All of these devices are to be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:

1. Alarm
2. Trouble
3. Open
4. Short
5. Ground
6. Device Fail/or Incorrect Service/detector in need of cleaning

B. All addressable devices are to have the capability of being disabled or enabled individually.

C. Addressable devices may be multi-dropped from a single pair of wires.

D. An Isolator shall be required to isolate each zone of addressable devices. The isolator module shall operate as an addressable device with the same capabilities of enable, disable, and annunciation.

E. The communication format must be a poll/response protocol to allow t-tapping of the wire to addressable devices and be completely digital. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission protocol. Systems that do not utilize full digital protocol (i.e. that may use time pulse width methods to transmit data etc.) will not be acceptable.

F. Each addressable device must be uniquely identified by an address code entered on each device at time of installation.

2.3 FIRE ALARM CONTROL PANEL (FACP)

A. Where shown on the plans provide and install an addressable audio fire alarm control panel. Construction shall be modular with solid state, microprocessor based electronics. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Although the keypad/keyboard can be used for control (firefighter/emergency) of the entire system; it shall only be used for maintenance purposes. Keyboards or keypads shall not be visible or required to operate the system during fire alarm conditions.

B. A local audible device shall sound during Alarm, Trouble, or Supervisory conditions. This audible device shall sound differently during each condition to distinguish one condition from another without having to view the panel. This audible device shall also sound differently during each key press to provide an audible feedback (chirp) to ensure that the key has been pressed properly.

C. Primary Keys & Panel Display:

1. The Control Panel shall have a 2 line x 40 character liquid crystal display which shall be backlit for enhanced readability. So as to conserve battery standby power, it shall not be lit during an AC power failure unless an alarm condition occurs or there is keypad activity.
2. The display shall support both upper and lower case letters. Lowercase letters shall be used for softkey titles and prompting the user. Uppercase letters shall be used for System Status information. A cursor shall be visible when entering information.

D. Function Keys

1. Additional field programmable function keys shall be provided to access status data for all system points. As a minimum, the status data shall include Disable/Enable Status, Verification Tallies of Initiating Devices, Acknowledge Status, etc.

E. LED Supervision

1. All slave module LEDs shall be supervised for burnout or disarrangement. Should a problem occur, the panel shall display the module and the LED location numbers to facilitate location of that LED.

F. Panel Features

1. The fire alarm control panel shall allow for loading or editing special instructions and operating sequences as required. The FACP is to be capable of on-site programming to accommodate and facilitate expansion, building parameter changes or changes as required by local codes without the need to replace IC chips. All software operations are to be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.
2. The ability for selective input/output control functions based on ANDing, ORing, NOTing, timing and special coded operations is to also be incorporated in the resident software programming of the system.
3. To accommodate and facilitate job site changes, initiation circuits shall be individually configurable on site to provide either alarm/trouble operation, alarm only, trouble only, current limited alarm, no alarm, normally closed device monitoring a non-latching circuit for an alarm verification circuit.
4. An operator, at the FACP, having a proper access level, shall have the capability to manually control the following for each analog sensor:

    a. Clear peak detection values
    b. Enable or disable the point
    c. Clear verification tally
    d. Control a sensor's relay driver output
    e. Change sensor sensitivity level

5. It shall be possible to program the control panel to automatically change the sensitivity settings of each analog sensor based on time-of-day and day-of-week (for example, to be more sensitive during unoccupied times and less sensitive during occupied periods). There shall be seven (7) sensitivity settings available for each photo sensor.
6. The control panel shall have the capability of being programmed for a pre-alarm or two-stage function. This function allows an indication to occur when, for example a 3% sensor reaches a threshold of 1.5% smoke obstruction.
7. At least 500 individually identified sensors as well as conventional initiating device and indicating appliance circuits shall be supported within a single FACP.

G. History Logging

1. The control panel shall have the ability to store a minimum of three hundred (300) events in an alarm log plus a minimum of 300 events in a separate trouble log. These events shall be stored in a battery protected random access memory (RAM). Systems not having discrete alarm and trouble logging memory shall include an alternate supervised (i.e. floppy drive, tape cassette) historic recording method with battery backup. Real time and date shall accompany all history event recording.

H. Walk Test with History Logging

1. The system shall be capable of being tested by one person. While in testing mode, the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after logging of the alarm.
2. The momentary disconnection of an initiating or indicating device circuit shall be silently logged as a trouble condition in the historical data file. The panel shall automatically reset itself after logging of the trouble condition.
3. Optionally, the walk test sequence will have the capability of activating the alarm indicating appliances If this option is selected, any momentary opening of an initiating or notification appliance circuit wiring shall cause the alarm indicating appliances to sound for 4 seconds to indicate the trouble condition.
4. Should the walk test feature be on for an inappropriate amount of time, it shall revert to the normal mode automatically.
5. The control panel shall be capable of supporting up to eight (8) separate testing groups whereby one group of points may be in a testing mode and the other (non-testing) groups may be active and operate as programmed per normal system operation. After testing is considered complete, testing data may be retrieved from the system in chronological order to ensure device/circuit activation.
6. Should an alarm condition occur from an active point, not in walk test mode, it shall perform all standard programmed alarm sequences.
7. Suppliers of systems not having this feature as functionally specified above shall include a testing agreement meeting the requirements of NFPA 72H in their base bid quotation. As a minimum, two (2) years of scheduled testing shall be included.

I. System Trouble Reminder

1. Should a trouble condition be present with the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as a reminder that the fire alarm system is not 100% operational. Both the time interval and the trouble reminder signal shall be programmable to suit the owner's application.

J. Access Levels

1. There shall be a minimum of four (4) access levels. Passcodes shall consist of up to ten (10) digits. Changes to passcodes shall only be made by authorized personnel. Systems not capable of password protected manual command operations shall provide key operated switches for these functions. Function key switches shall be keyed differently from any other keyed switches or locks used within the system.

2. In order to maintain security when entering a passcode, the digits entered will not be displayed. All key presses will be acknowledged by a local audible momentary tone.
3. When a correct passcode is entered, an "ACCESS GRANTED" message shall be displayed. The new access level shall be in effect until the operator leaves the keypad inactive for ten (10) minutes or manually logs out.
4. Should an invalid code be entered, the operator shall be notified with a message and shall be allowed up to three chances to enter a valid code. After three unsuccessful tries, an "ACCESS DENIED" message shall be displayed.
5. Access to a level will only allow the operator to perform all actions within that level and all actions of lower levels, not higher levels.
6. The following keys/switches shall have access levels associated with them:

    a. Alarm Silence
    b. System Reset
    c. Set Time/Date
    d. Manual Control
    e. On/Off/Auto Control
    f. Disable/Enable
    g. Clear Historical Alarm Log
    h. Clear Historical Trouble Log
    i. Walk Test
    j. Change Alarm Verification

7. Acknowledge keys shall also require privileged access to acknowledge points. If the operator presses an acknowledge key with insufficient access, an error message will be displayed. The points will scroll with each key press to view the points on the list, but the points will not get acknowledged in the database.

K. Audio System

1. A central audio control module shall be provided for the necessary alarm tone generation, main and remote microphone connection circuits. Continuous supervision shall be provided for all circuits, amplifiers and modules.
2. A hand-held, push-to-talk microphone shall be provided recessed within a protective panel-mounted enclosure. The microphone shall be a dynamic communication type with a frequency range of 200 Hz to 4000 Hz and shall be equipped with a self-winding five-foot coiled cable. An LED indicator shall be provided to indicate microphone push-to-talk button has been pressed and speaker circuits are ready for transmission. Microphone shall be supervised from disconnection.
3. An audio control switch module shall be furnished to provide manual controls of all audio functions. These switches and associated LED indicators shall be supervised from disarrangement or failure.
4. Audio power amplifiers shall be furnished with self-contained filtered 24VDC power supply, transformer and, amplifier monitoring circuits. Amplifiers shall provide a 25 or 75 VRMS output with a frequency response of 4,000Hz to 14,000Hz. Provide a sufficient quantity of amplifiers to operate all system speakers at the 1-watt tap simultaneously plus fifty (50) percent reserve capacity.

5. In addition provide at least one back-up amplifier capable of automatically replacing any failed amplifier.
6. Speakers and strobe shall be on separate circuits and operate independently from the strobe circuits.
7. Speaker and strobe circuits shall be zoned by floor with an isolating module on each circuit.
8. Speaker circuits shall be capable of supplying audio signals at 25 or 75 VRMS supplied by the system amplifiers. Supervision for open, short or ground fault conditions shall be provided. Individual and distinct trouble indications shall be provided for each fault.
9. Provide one circuit for each zone or area of distinct communication.
10. This panel shall be capable of providing a method for remote fire fighters telephone patch-in to the one-way voice communication speakers. Manual operation shall be controlled at the fire alarm control panel, or the remote microphone; if provided.

L. Tones

1. Main evacuating tone shall be the temporal code-three.
2. Optional tones shall include:

    a. The Hi/Lo
    b. Slow whoop

3. The hi/lo tone shall be a free running tone with a high frequency of 544 HZ and a low frequency of 440 HZ. The "on time" (Hi) shall be 100 milliseconds while the "off time" (Lo) is 400 milliseconds.
4. The slow whoop tone shall be a slowly ascending tone from 200 to 830 HZ in 2.5 seconds.

2.4 EXTERNAL DEVICES

A. Remote LCD Annunciators:

1. Where shown on drawings, provide and install flush mounted LCD annunciators. The annunciator shall communicate to the control panel over one twisted pair of wire and operating power shall be 24 VDC and be fused at the control panel.
2. The annunciators that are provided in the building vestibule shall have all control buttons programmed so that they are not operable. The one in the vestibule shall be annunciator only, with no controls.

    a. The LCD annunciator shall provide a common alarm and trouble circuit consisting of:

        1) Control pushbutton switches for: alarm silence, alarm acknowledge, supervisory acknowledge, trouble acknowledge, system reset, display time and up to four control keys for programmable operation duplicating the control panel switches.

2) A key "enable" switch or password control function shall be provided to activate or deactivate the control switches.
3) Tone Alert - Duplicates the control panel tone alert during alarm and trouble conditions.
4) System trouble LED.
5) Power on LED.
6) An 80 character LCD display. The top line of 40 characters shall be the point label and the second line shall be the device type identifier. The system alarm LED shall flash on the control panel and the remote annunciator until the alarm has been acknowledged. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another zone shall flash the system alarm LED on the control panel and remote annunciator. The LCD display shall show the new alarm information.
7) Alarm silence LED.

b. The annunciator's display shall be backlit for enhanced readability. So as to conserve battery standby power, it shall not be lit during an AC power failure unless an alarm condition occurs or there should be keypad activity.
c. The display shall support both upper and lower case letters. Lowercase letters shall be used for softkey titles and prompting the user. Uppercase letters shall be used for System Status information. A cursor shall be visible when entering information.
d. Under normal conditions, the front panel shall display a "System is Normal" message and the current time and date.
e. Should an abnormal condition be detected, the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
f. The LCD shall display the following information relative to the abnormal condition of a point in the system.

1) 40 character custom location label.
2) Type of device (i.e. smoke, pull station, waterflow).
3) Point status (i.e. alarm, trouble).

3. To accommodate the facilitation of job site changes, the control switches shall have the capability to be programmed on site to provide for manual switch input operation other than their standard purpose.

B. Visual Flashing Lamps (Xenon Strobe) dry locations:

1. Visual indicating appliances shall comprise a Xenon flashtube and be entirely solid state. These devices shall be UL listed and comply with current ADA requirements, producing the candela listings as indicated below and be capable of either ceiling or wall mounting. Visual units shall incorporate a built-in reflector to improve lighting characteristics.
2. Candela requirements per NFPA 72 as shown on drawings.

3. The LEXAN lens shall be pyramid shaped to allow better visibility. Provide vandal resistant unit. Visual units shall be incorporated as part of every horn assembly and shall be individually mounted where shown on the drawings.
4. The location of the visual indicator is approximate. Install in the room, at any location, as long as the indicator can be viewed from all usable spaces within the room. Mount visual indicator where it does not conflict with other wall finishes or other equipment.
5. Color shall be red and white

C. Audible/Visual Notification Alarm Appliance (horn/ strobe) dry location:

1. Visual units shall provide a common enclosure for the fire alarm audible and visual alarm devices. The unit shall be complete with a tamper resistant, Pyramidal shaped lexan lens with "Fire" lettering visible from a 180 degree field of view. The front panel or bezel which is constructed of UL Listed Noryl, may be inverted so that the lens is below the audible device.
2. Integral Xenon strobe shall be adjustable from 1 to 3 flashes per second.
3. Candela requirements per NFPA 72 as shown on drawings.
4. Separate control of strobe shall be provided to allow silence of horns whit strobe still activated. Unit shall be complete with all mounting hardware including backbox, for semi-flush mounting. For existing construction, surface mounted unit may be provided. All surface hardware shall be painted to match device color. Visual unit shall be UL Listed for its intended purpose and comply with current ADA requirements. Units shall be vandal resistant.
5. Color shall be white

D. Addressable Peripheral Devices: The system control panel, over its two wire multi-drop channel, must be capable of communicating with the types of addressable devices specified below. Addressable devices will be located as shown on the drawings.

E. Addressable Pull Stations:

1. Addressable pull stations will contain electronics that communicate the station's status (alarm. normal) to the control panel over two wires which also provide power to the pull station. The address will be set on the station. The stations will be manufactured from high impact red Lexan. Lettering will be raised and painted white. The station will mechanically latch upon operation and remain so until manually reset by opening with a key common to all systems locks. Pull stations shall be double action, push/pull.
2. The front of the station is to be hinged to a back plate assembly and must be opened with a key to reset the station. The key shall be common with the control panels. Stations which use Allen wrenches or special tools to reset will not be accepted. The station shall consist of high impact Lexan, red in color.
3. The addressable manual station shall be capable of field programming of its "address" location on an addressable signaling line circuit.
4. There shall be no limit to the number of stations, detectors or Zone Adapter Modules, which may be activated or "in alarm" simultaneously.
5. The addressable manual station shall be Underwriter's Laboratories, Inc. listed.

F. Smoke Sensors:

1. The smoke sensors shall be of the photoelectric type and shall communicate actual chamber values to the system control panel.
2. The smoke sensors and bases shall be listed to UL Standard 268 and documented compatible with the control equipment to which they are connected. The sensors shall be listed for both ceiling and wall mount applications.

G. Photoelectric Sensor Head:

1. The sensor shall be of the solid state photoelectric type and shall contain no radioactive material. They will use a pulsed infrared LED light source and be sealed against rear air flow entry.
2. The photoelectric type sensor shall be a plug-in unit which mounts to a twist-lock base.
3. The sensor shall fit into a base that is common with both the heat sensor and ionization type sensor and shall be compatible with other addressable detectors, addressable manual stations, and addressable Zone Adaptor Modules on the same circuit.
4. There shall be no limit to the number of sensors, stations or Zone Adaptor Modules which may be activated or "in alarm" simultaneously.
5. Each sensor will be capable of sensing up to (7) sensitivity levels ranging between .5% and 3.7%.
6. The photoelectric sensor shall have a fine 30 mesh insect screen.
7. The sensor electronics shall be completely shielded to protect against false alarms from EMI and RFI (Electromagnetic and Radio Frequent Interference).

H. Photoelectric Duct Detector:

1. The sensor shall be photoelectric type, which obtains its operating power from the supervisory current in the fire alarm detection loop.
2. Sensors shall be of the solid state photoelectric type and shall operate on the light scattering, photodiode principle. To minimize nuisance alarms, detectors shall have a minimum 30 mesh insect screen and be designed to ignore invisible particles or smoke densities that are below the factory set point. No radioactive material shall be used.
3. Detector construction shall have a mounting base with a twist-lock sensing head. The locking feature must be field removable when not required. Contact between the base and head shall be of the bifurcated type utilizing spring type, self-wiping contacts. Removal of the sensor head shall interrupt the supervisory current of the fire alarm detection loop and cause a trouble signal at the control panel. Detector design shall provide compatibility with other addressable detectors, addressable manual stations and addressable zone adapter modules on the same circuit.
4. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
5. Auxiliary DPDT relays and/or remote LED alarm indicators with key test switch shall be provided for each duct detector.
6. Activation of relays shall be performed through the system program. Tracking the alarm only condition of the duct sensor is not acceptable.

7. Each sensor base shall contain a LED that will flash each time it is scanned by the control panel (once every 4 seconds). When the control panel determines that a sensor is in the alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable.
8. Each sensor shall be scanned by the control panel for its type identification to prevent inadvertent substitution of another sensor type. The control panel shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.
9. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
10. Provide a remote alarm/power LED key test switch indicator for each smoke detector. Indicators to be mounted at 48" above finished floor into the area where the smoke detector is located. In mezzanine areas or other areas where air handlers are located, provide remote indicator near doorway or stairway entering into the room. Installation of remote detector shall be coordinated with other equipment in the mechanical equipment room. Every unit shall be equipped with an engraved nameplate indicating which air handler it handles. Every smoke detector on the air handler or the air handler shall have a 1" x 3" engraved label clearly indicating which air handler it is. If the remote indicator is not shown on the floor plans, get direction from the Architect or Engineer to determine the location of the detector.

I. Addressable Sensor Bases:

1. Sensor bases shall be compatible with all models of sensors. Each base is capable of communicating sensor values to the panel if a "wrong device type" trouble condition is present. The panel will continue to monitor for alarms and troubles using the default setting for the wrong device until the proper type is installed or the program is changed.
2. Each sensor base shall contain a LED that will flash each time it is scanned by the control panel (once every 4 seconds). When the control panel determines that a sensor is in the alarm or a trouble condition, the control panel shall command the LED on that sensor's base to turn on steady indicating the abnormal condition. Sensors which do not provide a visible indication of an abnormal condition at the sensor location shall not be acceptable.
3. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

    a. The sensor base shall annunciate power-on, alarm and trouble conditions locally at the base.
    b. In addition, where shown on plans, the sensor base shall remotely annunciate power-on, alarm and trouble conditions using a remote LED indicator.

4. Sensor Base with Relay:

a. Where shown on plans, for elevator smoke detectors, and for smoke detectors associated with smoke doors, the sensor base shall include a control relay for programmable function.
b. The relay shall not take any additional addressable device capacity.
c. The relay shall provide (2) sets of Form C contacts rated 3 amps and powered from the system 24 VDC and operate in battery standby.
d. Relay shall mount in same electrical box the sensor base is installed on.
e. Wire relay to interconnect with magnetic hold opens where shown on drawings. The smoke detector shall be configured such that the smoke detector will directly control the magnetic hold-open devices and will cause only those doors associated with the detector to close. All doors shall not close at once.

J. Fire Alarm Control Multiplex Operation (Miniplex):

1. The system shall be capable of providing multiplex operation by using the fire alarm control panel as a central processing unit (CPU) that provides Style 4 or Style 7 communications up to 31 remote transponders. All data communications wiring between the CPU and transponders shall be supervised for opens, shorts, and grounds. The remote transponders shall be capable of containing up to 31 selectable fire alarm control panel modules to provide the following functions:

a. Interface modules, each capable of communicating to up to 127 devices via the Multiple Addressable Peripheral detectors, smoke sensors, and other addressable initiating and control devices as described in section 9.
b. Power supply and charger capable of providing 8 amps of system power and capable of charging up to 50 AH batteries powered by 120 HVA, 60 Hz.
c. Initiating circuits for Style B or Style A operation.
d. Notification Appliance circuits for Style Y or Style Z.
e. Auxiliary control relay circuits with feedback to monitor circuit connection.
f. Isolator module to provide line isolation of shorted segments.
g. Input/Output Graphic Driver Interface.
h. Front panel mounted status indicating LEDs including with provision for selecting and changing LED color on-site.
i. Momentary switches with status indicating LEDs.
j. Three position (on-off-auto) maintained switches with status indicating LEDs.
k. Packaging shall include solid door with beige paint.

2.5 PROGRAMMABLE MODULES

A. Programmable Input Modules shall be the used for monitoring of waterflow, valve tamper, and non-addressable devices.

B. These modules shall be addressable and shall be provided for interfacing open and direct contact devices to the addressable signaling circuit.

C. Provide addressable output modules. These shall be for operating non-addressable devices, such as air handler starters, smoke dampers, security equipment, magnetic holders, and other devices requiring fire alarm system control.

D. For non-supervised control.

1. This type of addressable device will provide double pole double throw relay switching for loads up to 120 VAC. It will contain easily replaceable 2 amp fuses, one on each common leg of the relay.
2. The AM shall be supervised and uniquely identified by the control panel. Device identification shall be transmitted to the control panel for processing according to the program instructions. Should the AM become non-operational, tampered with, or removed, a discrete trouble signal, unique to the device, shall be transmitted to, and annunciated at, the control panel.
3. The AM shall be capable of being programmed for its "address" location on the addressable device signaling circuit. The AM shall be compatible with addressable manual stations and addressable detectors on the same addressable circuit.
4. All devices will be supervised for trouble conditions. The system control panel will be capable of indicating the type of trouble condition (open, short, device missing/failed). Should a device fail, it will not hinder the operation of other system devices. Should a problem occur on a particular wire run, it will not affect other wire runs.

2.6 AHU SYSTEM INTERFACE

A. Duct Smoke Detectors and Addressable Control Modules, or Supervised Remote Relays shall be provided as specified below. Duct Smoke Detectors shall be installed in compliance with the manufacturer’s recommendations. Each Addressable Control Module or Supervised Remote Relay for AHU and / or Fan shutdown shall be installed within 3 feet of the Temperature Control Panel to which it is connected. The Division 26 EC shall provide all wiring and terminations required for shutdown of the specified AHUs / Fans.

B. The Addressable Control Modules or Supervised Remote Relays provided for this purpose shall be provided with DPDT output contacts. One SPDT set of the DPDT contacts shall be utilized for the specified shutdown function. The second SPDT set of the DPDT contacts shall be available for connection to the temperature controls, to indicate that unit shutdown – due to Duct Smoke – has occurred.

C. The control panel shall provide an output alarm interface to the air handling/energy management system controllers, which in turn shall perform automatic function as specified in the applicable sections of Division 15.

D. An override feature/control switch shall be provided which shall prevent shutdown of AHUs when this function is active.

E. Programming: (This shall apply to All AHUs / Fans listed above):

1. Upon actuation of a duct smoke detector installed at the AHU the AHU shall shut down.

2. The associated fan shall be shut down only upon actuation of the duct smoke detector associated with the particular unit.
3. All such AHUs / fans shall remain shut down, until a valid System Reset occurs.

2.7 SPRINKLER SYSTEM SUPERVISORY SERVICE

A. The control panel shall have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch.

B. The activation of any standpipe or sprinkler valve supervisory (tamper) switch shall activate the system supervisory service audible signal and illuminate the LED at the control panel and FAAP. The panel shall provide differentiation between valve tamper activation and opens and/or grounds on the initiation circuit wiring.

1. Each Valve Tamper Switch shall be individually monitored, except for pairs of valves associated with the “Double Check Valve”. The Descriptors, which are used to describe these tamper switches, shall identify the function or sprinkler zone associated with the valve.
2. Each Flow Switch and Pressure Switch, which are used to indicate discharge, shall be individually monitored, and shall cause the actuation of the proper Alarm Sequence corresponding to the location of the Sprinkler Zone. The Descriptors, which are used to describe these flow and pressure switches, shall identify the associated sprinkler zone. In other words – describe where the water should be going, not the location of the Flow or Pressure Switch.
3. The function of each valve, flow switch, and pressure switch, associated with the Fire Protective Sprinkler System shall be available, upon request by the successful Electrical Bidder, from Owner, the Fire Protection Engineer or Fire Protection Contractor.

C. Pressing the supervisory service acknowledge key will silence the supervisory audible signal while maintaining the supervisory service LED "on" indicating the off-normal condition.

D. Restoring the valve to the normal position shall automatically reset the tamper indication.

E. Supervisory Status conditions may be programmed as self-restoring – once the valve has been fully opened, or the monitored suppression system has been returned to service, a “restored to normal” message shall appear at the FACP and FAAP, and shall also be logged to the system history log.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.

B. Verify field measurements are accurate and shown on drawings.

C. Verify proper power connections are installed.

D. Proceed with installation only after unsatisfactory conditions are corrected.

E. All wiring shall test free from grounds and shorts.

3.2 FIELD MEASUREMENTS

A. Field verify proper mounting heights of all devices.

B. Field verify surfaces which equipment will be located. Verify adequate room for recessed equipment. Adjust locations to satisfy field measurements.

C. Mounting heights as shown on drawings and details. Coordinate final locations with on-site architect prior to rough-in.

3.3 DELIVERY, STORAGE & HANDLING

A. Receive, sign for, and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment, and written notice received from Architect stating that these conditions exist at building site.
4. Install power supplies as required based on equipment per manufacturer.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. System Wiring

1. The system wiring and installation shall be in compliance with applicable codes, project drawings and as required by the manufacturer. All wiring shall be color coded, tagged and checked to assure that it is free from shorts and grounds. Provide record drawings of installation.
2. Note: Electrical contractor shall provide duxseal at each smoke detector to seal the conduit.
3. All wiring associated with the smoke control system shall be installed in conduit, wiring associated with the fire alarm system free-air wiring.

D. Raceways

1. NOTE: ALL FIRE ALARM SYSTEM WIRING SHALL BE INSTALLED WITHIN METALLIC CONDUIT UNLESS SPECIFIED.
2. All wiring shall be in a conduit system separate from other building wiring. See Section 26 05 34 - Raceways for specifications.
3. All wiring shall be in minimum ½" steel raceway.
4. 40% fill factor shall be applied to all conduit sizes.
5. The contractor shall size conduit and boxes by circular mil size of each cable in each conduit or box..
6. There shall be no sharp edges with installed materials.

E. Free Air Wiring:

1. All wiring shall be run “free-air”, in conduit or in surface raceway. "Free-air" wiring for horizontal cable runs of Power Limited Fire Alarm (PLFA) DC circuits as approved by the Engineer shall be the method of installation in the following areas:

    a. Finished accessible ceiling only
    b. All areas with no lay in ceilings wiring must be in conduit.

2. Where installed “free-air”, installation shall meet the following:

    a. Cable shall run at right angles and be kept clear of other trades work.
    b. Cables shall be supported according to code utilizing "Bridal-type" mounting rings or J hooks anchored to ceiling concrete, piping supports or structural steel beams. Rings shall be designed to maintain cables bend to larger than the minimum bend radius (typically 4 x cable diameter).
    c. Supports should be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 12-inches, another support shall be used. No cable can rest on other building supports or ductwork or piping. All cabling must be supported with individual j hooks or D rings
    d. Cable shall never be laid directly on the ceiling grid.
    e. Cables shall not be attached to or supported by, existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.

3. A coil of 2 feet in each cable shall be placed in the ceiling at each “free-air” wired fire alarm device. These "service loops" shall be secured at the last cable support before the cable reaches the device and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.
4. Devices wired with conduit shall be provided with an 8-inch wire tail at each device box and 36-inch wire tails at the FACP and FAAP.
5. To reduce or eliminate EMI, the following minimum separation distances from <480V Power lines shall be adhered to:

    a. Twelve (12) inches from power lines of <5-kVa.
    b. Eighteen (18) inches from high voltage lighting (including fluorescent).
    c. Thirty-nine (39) inches from power lines of 5-kVa or greater.
    d. Thirty-nine (39) inches from transformers and motors.

6. All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellem grips may be used to spread the strain over a longer length of cable.
7. Manufacturers minimum bend radius specifications shall be observed in all instances. Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.
8. All vertical cable extensions to fire alarm devices located below the finished ceiling shall be in conduit.
9. It is the contractors' responsibility to survey the site and include all necessary costs to perform the installation as specified. This includes any modifications required to route and conceal horizontal distribution wiring.
10. Beginning installation means contractor accepts existing conditions.
11. Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a hazard to the cable, shall not be used.
12. All cable shall be pulled by hand unless installation conditions require mechanical assistance. Where mechanical assistance is used, care shall be taken to insure that the maximum tensile load for the cable as defined by the manufacturer is not exceeded. This may be in the form of continuous monitoring of pulling tension, use of a “break-away” or other approved method.
13. The contractor will be responsible for identifying and reporting to the Site Coordinator(s) any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. The Contractor must repair all damage to interior spaces caused by the installation of cable; raceway or other hardware. Repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor-damaged ceiling tiles are to be replaced to match color, size, style and texture.
14. Where unacceptable conditions are found, the Contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.

15. Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work. During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.
16. Cable pulling shall be done in accordance with cable manufacturer's recommendations and ANSI/IEEE C2 standards. Manufacturer's recommendations shall be a part of the cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed.
17. Avoid abrasion and other damage to cables during installation.
18. Pulling Lubricant may be used to ease pulling tensions. Lubricant shall be of a type that is non-injurious to the cable jacket and other materials used. Lubricant shall not harden or become adhesive with age.
19. A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.

F. Conductors

1. All wire and cable associated with this system shall be as required by the equipment manufacturer. The following information is intended for estimating purposes only. However, the minimum wire gauges and colors specified shall be strictly adhered to. All cable shall be installed as per NEC Article 760.
2. Type FPL wiring is required if the system is run in conduit or 'free-air'.
3. All initiation and notification circuit cabling shall be listed Type FPL (300V) in accordance with NEC article 760."
4. All cables and wires #14 AWG and larger shall be stranded.
5. Fire alarm wiring shall be held in place at the device box, by means of a two-screw connector, (do not use squeeze or crimp type connectors).
6. All wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, disarrangement of any components, any open circuits or grounds in the system, an audible and visual trouble signal shall be activated until the system is restored to normal.
7. All conductors shall be color-coded. Coding shall be consistent through out the facility. Green wire shall be used only for equipment ground.
8. Power wiring for Fire Alarm Control Panel [Annunicator Panel]. [and Remote Fire Command Center] shall be #12 AWG.
9. Leave 8-inch wire tails at each device box and 36-inch wire tails at the Fire Alarm Control Panel [and Remote Annunciator Panel(s).
10. Cable for Intelligent detector Loops shall be 18 to 12 AWG twisted pair with a shield jacket installed in ½" conduit. Shield continuity must be maintained and connected to earth ground only at the control panel.
11. SLC wiring must not be in the same conduit with AC power wiring or other high current circuits. T-taps or branch circuit connections are allowed for all class B SLCs.
12. Cable for RS 232-c devices (CRT, PRINTER) shall be dual pair twisted- shielded.
13. Cable for RS 485 devices (Remote Annunciators) shall be twisted-shielded pair (Belden 9841 or equivalent) for the data signal. Power wiring shall be 12 AWG.

14. All splices or connections shall be made within approved junction boxes and with approved fittings. Boxes shall be red and labeled "FIRE ALARM SYSTEM" or “FA” by decal or other approved markings.
15. Speaker and strobe circuits shall have separate conductors, and shall operate independently of each other.
16. [Mini horn wiring shall be #14 AWG minimum.]
17. Speaker wiring shall be as recommend by manufacturer.
18. Strobe wiring shall be #14 AWG minimum or as recommend by manufacturer.
19. Tray cable is not acceptable for use as fire alarm system wiring installed in conduit.
20. [All cable run as “Free-Air” shall be Tray Cable rated.]

G. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier’s recommendations.

    a. Each cabinet frame shall be grounded. Equipment cabinets shall be bonded directly to the building electrode grounding.
    b. All exterior panels of cabinets shall be bonded to the cabinet frame.
    c. All equipment installed in a cabinet shall be bonded to the cabinet frame.

H. Mounting Heights

1. Mounting heights:

    a. Fire alarm station: to center 42"
    b. Fire alarm signals and strobes- 80" above the floor (shall be to the highest point in the space i.e. above highest riser level in Band rooms, highest floor level in Auditoriums, etc.) to bottom or 6" below the ceiling, whichever is lower.
    c. Fire alarm annunciators: to bottom 48"
    d. Fire alarm control panel - mount such that the top of the fire alarm control panel is not higher than 6'.
    e. Floor plan graphic, adjacent to fire alarm annunciators.

I. Programming

1. All programming that is required for installation shall be done by this contractor. The contractor shall assume that his vendor is to meet with the owner to determine if there are any extraordinary programming circumstances. The supplier shall go over the entire sequence of operation of the fire alarm panel and explain what the various programming sequences are.
2. Device addresses shall utilize Owner’s room numbers and not room numbers provided on drawings. Include building area in address. See floor plan graphic description for additional information.

J. Junction Boxes

1. Provide fire alarm pull and junction boxes per specification section 26 05 53.

K. Final Testing

1. The completed fire alarm system shall be fully tested in accordance with NFPA by the Contractor in the presence of the Owner's representative and the Engineer if engineer requests such. Upon completion of a successful test, certify in writing to the Owner.
2. All wiring shall test free from all grounds and shorts.
3. The completed system shall be tested in accordance with NFPA 72. Provide a certified test report from the manufacturer's representative that the system complies with NFPA and State codes. All technicians performing work on this project shall be factory trained and at minimum, NICET level two certified in fire alarm systems.
4. Provide NFPA fire alarm test report per NFPA 72.
5. Fill out the fire alarm system checklist included as a part of this specification. This checklist shall be included with the final O&M operation manual and will be required prior to final payment being made on this equipment.

3.5 MOUNTING OF SMOKE DETECTORS

A. Smoke detectors shall not be installed until final room finishes and carpeting have been laid. As an option to this, the contractor may install the smoke detector, but it must be protected by a plastic bag to prevent dust entering the smoke detector. Install the smoke detectors in this manner to prevent erroneous alarms. If smoke detectors are installed prior to final room finishes being completed and floor finishes being installed, this contractor shall bear the expense of returning the smoke detectors to the factory for cleaning and recalibration.

3.6 OWNER TRAINING

A. Provide complete operator training for the Owner's personnel.

B. Provide two training sessions on consecutive days at times set by the Owner. These should be scheduled as part of the Owner's pre-occupancy transition training.

C. Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

D. Have owner sign certificate stating that he has received instruction on the fire alarm equipment; see spec section 26 05 04.

3.7 SPARE EQUIPMENT

A. Provide the following spare parts:

1. Provide 1 spare pull station.
2. Provide 1 spare speaker/strobe.
3. Provide 2 spare xenon strobes.

END OF SECTION 28 31 10

SMOKE CONTROL AND FIRE ALARM SYSTEM STARTUP CHECKLIST

Date _____

Building Name _____

Facility Owner _____

Installing Contractor _____

Equipment Supplier _____

Equipment Manufacturer _____

Factory Authorized Technician _____

The smoke control system is fully functional and all devices connected to this system are operating correctly and status of each device is indicated on the control panel. Yes _____ No _____ NA _____

Each fire alarm pull station must be individually tested for system activation and proper zone annunciation. This was done and tested and is in compliance. Yes _____ No _____ NA _____

Each room smoke detector must be individually tested for system activation and proper zone annunciation and remote indicator operation. This was done and tested and is in compliance.
Yes _____ No _____ NA _____

Each heat detector was individually tested for system activation and proper zone annunciation. This was done and tested and is in compliance. Yes _____ No _____ NA _____

Each duct detector was individually tested for fire alarm system activation, and air handler shut down. Only that air handler protected by a smoke detector shall shut down. This was done and tested and is in compliance.
Yes _____ No _____NA _____

Each fire door with magnetic hold opens and ceiling mounted detectors was tested for fire alarm activation, door closure and proper zone annunciation. Note that this shall be tested so that only those doors that are connected with the local smoke detectors are to close; no other doors are to close. This was done and tested and is in compliance. Yes _____ No _____ NA _____

Elevator smoke detectors: The elevator smoke detector system was tested for proper elevator control, fire alarm system activation, and zone annunciation. This was done and tested and is in compliance.
Yes _____ No _____NA _____

I hereby certify that the fire alarm system was tested as indicated above. It was found to be operating and complies with State and NFPA codes.

Signed _____ Printed Name _____

System Designer:
MSA Professional Services, Inc.
116 Fremont Street
Kiel, WI 53042
Phone (920) 894-7800

CITY OF SHEBOYGAN

REQUEST FOR PUBLIC WORKS COMMITTEE CONSIDERATION

ITEM DESCRIPTION: A resolution authorizing the appropriate City Officials to enter into a contract with J. H. Hassinger, Inc. for the renovation of 1817 N. 8th Street to be used as the new location for Uptown Social / the Sheboygan Senior Activity Center, and authorizing the appropriate City officials to make the necessary budget adjustments and appropriations to provide funding for this contract.

REPORT PREPARED BY: Bernard R. Rammer, Purchasing Agent

REPORT DATE: December 8, 2021 **MEETING DATE:** December 14, 2021

FISCAL SUMMARY:

Budget Line Item:	Various-see Resolution
Budget Summary:	CDBG
Budget Expenditure:	$3,846,961.00
Budgeted Revenue:	N/A

STATUTORY REFERENCE:

Wisconsin Statues:	N/A
Municipal Code:	N/A

BACKGROUND / ANALYSIS: The City of Sheboygan purchased the former Sav-a-Lot Grocery store at 1817 North 8th Street with the intention to transform the building into the new home of the Senior Activity Center/Uptown Social. The City issued bids for the project based upon the Architectural and Engineering plans developed by Groth Design Group.

STAFF COMMENTS: Following a review of the bids it was determined that the bid submitted by J.H Hassinger Construction of Menomonee Falls, WI has met all requirements for award. The project is far reaching and includes improvements to both the interior and exterior as well as virtually all of the systems serving the building. Once completed, it will transform the building into a space designed around the functional and programming needs of the Senior Activity Center and will be ready to serve the public for many years. The project is being funded with a variety of sources including an $89,000 contribution from the Friends of the Senior Activity Center and ARPA funding from the Federal Government. The requested funding also includes a change order allowance which is appropriate for a project of this size and scope.

ACTION REQUESTED: Motion to recommend that the Council adopt Res. No. 111- 21-22 authorizing the appropriate City Officials to enter into contract with J. H. Hassinger, Inc. for the renovation of 1817 N. 8th Street to be used as the new location for Uptown Social / the Sheboygan Senior Activity Center, and authorizing the appropriate City officials to make the necessary budget adjustments and appropriations to provide funding for this contract.

ATTACHMENTS:

I. Res. No. 111-21-22
II. Title VI Addendum
III. Sheboygan Senior Activity Center / Uptown Social Phase I Remodel Project Manual

CITY OF SHEBOYGAN

REQUEST FOR PUBLIC WORKS COMMITTEE CONSIDERATION

ITEM DESCRIPTION: A resolution authorizing the appropriate City Officials to enter into a contract with Specht Electric Co., Inc. to replace the generator and perform related electrical upgrades at the Municipal Service Building.

REPORT PREPARED BY: Bernard R. Rammer, Purchasing Agent

REPORT DATE: December 8, 2021 **MEETING DATE:** December 14, 2021

FISCAL SUMMARY:

Budget Line Item:	48033110-621200
Budget Summary:	Capital Improvements Fund
Budget Expenditure:	$ 328,995.00
Budgeted Revenue:	N/A

STATUTORY REFERENCE:

Wisconsin Statues:	N/A
Municipal Code:	N/A

BACKGROUND / ANALYSIS: The Emergency Generator and electrical service panels at the Municipal Service Building are original to the building and have exceeded their expected useful life. In addition, changes in the electrical code require additional improvements and enhancements to building wiring associated with emergency lighting.

STAFF COMMENTS: The City issued bids for the project. The Low bid, submitted by Specht Electric and Communications of Sheboygan has been found to meet all of the necessary criteria. The generator manufactured by Kohler Company, has an anticipated lead time of 40 plus weeks after receipt of the order so it is imperative that the order be placed as soon as possible.
The upgrades to the wiring and service panels will bring the facility back into compliance with current electrical codes and the new generator will assure the facility has adequate emergency electrical power.

ACTION REQUESTED: Motion to recommend the Common Council adopt Res. No. 115-21-22 authorizing the appropriate City Officials to enter into a contract with Specht Electric Co., Inc. to replace the generator and perform related electrical upgrades at the Municipal Service Building.

ATTACHMENTS:
I. Res. No. 115-21-22
II. Specht Electric Co., Inc. Agreement

III. City of Sheboygan Municipal Service Building Generator and Service Replacement Project Document

III

DIRECT REFERRAL TO PUBLIC WORKS COMMITTEE

Res. No. 115 - 21 - 22. By Alderpersons Dekker and Perrella.
December 14, 2021.

A RESOLUTION authorizing the appropriate City officials to enter into a contract with Specht Electric Co., Inc. to replace the generator and perform related electrical upgrades at the Municipal Service Building.

WHEREAS, the City of Sheboygan has advertised for bids to replace the generator at the Municipal Service Building, and perform related electrical upgrades (the "Project"); and

WHEREAS, the low bid was from Specht Electric Co., Inc. in the amount of $328,995.00; and

WHEREAS, City Staff has reviewed the bids and discovered that the low bid met all of the specifications.

NOW, THEREFORE, BE IT RESOLVED: That the appropriate City officials are authorized to enter into a contract with Specht Electric Co., Inc., a copy of which is attached hereto and incorporated herein, for the Project.

BE IT FURTHER RESOLVED: That the appropriate City officials are hereby authorized to draw funds for the work in the amount of $328,995.00 from Account #48033110-621200.

PW

_____

_____

I HEREBY CERTIFY that the foregoing Resolution was duly passed by the Common Council of the City of Sheboygan, Wisconsin, on the _____ day of _____, 20____.

Dated _____ 20____. _____, City Clerk

Approved _____ 20____. _____, Mayor

AGREEMENT
BETWEEN THE CITY OF SHEBOYGAN, WISCONSIN AND
SPECHT ELECTRIC CO., INC.

TO REPLACE THE EXISTING GENERATOR AT THE MUNICIPAL SERVICE BUILDING

This Agreement ("Agreement") is made and entered into effective this ____ day of _____, 2021 (the "Effective Date"), by and between the City of Sheboygan (the "City"), a municipal corporation, and Specht Electric Co., Inc. ("Contractor").

WITNESSETH:

WHEREAS, the City is the owner of the Municipal Service Building at 2026 New Jersey Ave. (the "Municipal Service Building"); and

WHEREAS, the City wishes to replace the generator at the Municipal Service Building; and

WHEREAS, the City issued Request for Bids 2005-21 to obtain bids from qualified providers of the materials and services needed to complete this replacement (the "Services"); and

WHEREAS, the City has opened the bids, and determined that the bid from Contractor ("Bid") is the lowest responsive and responsible bid for the Services; and

WHEREAS, Contractor desires to provide the City with the necessary Services under the terms set forth in this Agreement.

NOW, THEREFORE, the parties hereto agree as follows:

Article 1. Scope of Services
Contractor shall provide all labor, equipment, and materials necessary to replace the existing generator, transfer switches, main service disconnect/CT, and outdated panelboards at the Municipal Services Building, and rewire the Municipal Service Building to comply with the latest emergency egress lighting code (the "Services").

The Services will be done pursuant to the Project Manual, which is attached to this Agreement as Exhibit 1.

Contractor is responsible for the provision of all licenses and permits[1] and for paying all legitimate costs required by private utility and communication companies as part of the Services.

[1] Contractor shall be responsible for obtaining any and all applicable City permits and paying any and all applicable permit fees prior to beginning work.

Article 2. Standard of Care

Contractor shall be responsible for completion of the Services in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances ("Standard of Care"). The City's Representative shall be the sole judge of the adequacy of Contractor's work in meeting the Standard of Care; however, the City's Representative shall not unreasonably withhold its approval as to the adequacy of Contractor's performance. Upon notice to Contractor and by mutual agreement between the parties, Contractor will, without additional compensation, correct or replace any and all Services not meeting the Standard of Care.

Contractor shall be solely responsible for all construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under this Agreement.

Article 3. City's Representative

The City designates Mike Willmas as its Representative for purposes of this Agreement. If the City's Representative deem it appropriate, the City's Representative may consult with other employees of the City, or may retain an appropriate outside expert to assist with the management of this Project.

If the City's Representative observe any work performed by the Contractor to not be in conformity with the Agreement, the City's Representative will report that to the Contractor. The City's Representative will have authority to stop any portion of the work not in conformity with the Agreement until the City has investigated and decided upon an appropriate procedure.

Article 4. Compensation

The City shall pay Contractor for the Services an amount not to exceed $328,995.00 ("Contract Amount").

Within 10 days of receipt of the City's Notice to Proceed, the Contractor shall submit a complete breakdown of the Contract Amount, showing the value assigned to each part of the work, including an allowance for profit and overhead (the "Schedule of Values"). Upon approval of the breakdown of the Contract Amount by the City's Representative, it shall be used as the basis for all Requests for Payment.

Contractor may submit periodically, but not more than once each month, a Request for Payment of work done on the site. The Contractor shall furnish the City's Representative with information reasonably requested regarding the progress and execution of the work in order for the City's Representative to review the Request for Payment. Each Request for Payment shall be computed from the work completed on all items listed in the Schedule of Values, less 10% to be retained until Final Acceptance. No payment will be made for material merely stored at the job site.

Payment will be made to Contractor within 45 days of receipt of the Request for Payment. The Request for Payment shall be sent to:

Michael Willmas
City of Sheboygan
2026 New Jersey Avenue

Sheboygan, Wisconsin 53081

Contractor shall be required to file waivers of lien from all suppliers and subcontractors with the Owner prior to receiving payment. The submission of any Request for Payment shall be deemed a waiver and release by Contractor of all liens and claims with respect to the work and period to which such payment request pertains except as specifically reserved and noted on such request.

Contractor shall deliver to the City a complete release of all liens arising out of this Agreement before the retained percentage or the Final Payment is paid. If any lien remains unsatisfied after the retained percentage or the Final Payment is paid, Contractor shall refund to the City such amounts as the City may have been compelled to pay in discharging such liens (including any costs and reasonable legal fees).

Additional services not set forth in Article 1, or changes in the Services must be authorized in writing by the City or its Representative prior to such work being performed, or expenses incurred. The City shall not make payment for any unauthorized work or expenses.

The City may – in addition to the retained percentage – withhold payment, in whole or in part, to the extent necessary to protect itself from a loss on account of any of the following ("Withheld Amounts"):

- Payments that may be earned or due for just claims for labor or materials furnished in and about the work.
- Defective work.
- The probable filing of claims by other parties against Contractor which may adversely affect the City.
- Failure of Contractor to make payments due to subcontractors, material suppliers, or employees.
- Damage to the City or a third party.
- Reasonable doubt that the Agreement can be completed for the balance then unpaid.
- Liquidated damages due to the City.

The City will disburse, and shall have the right to act as agent for Contractor in disbursing the Withheld Amounts to the party or parties who are entitled to payment. The City will provide the Contractor with a proper accounting of all such funds disbursed on behalf of the Contractor.

The City also reserves the right to refuse payment of the final 10% due to Contractor until the City's Representative is satisfied that all subcontractors, material suppliers, and employees of the Contractor have been paid in full.

Partial payment made under this Agreement is not evidence of the proper performance by Contractor either in whole or in part, and no payment made by the City shall be construed to be an acceptance of defective or improper work. Acceptance of the work by the City shall occur only upon Final Payment by the City which will occur after Final Acceptance. The Parties recognize that more than 45 days may elapse between the submission of the last invoice and Final Acceptance or Final Payment. The

City agrees to make reasonable efforts to schedule its Final Inspection in a timely manner and to process the Final Payment in a timely manner upon Final Acceptance. (For the avoidance of doubt, the warranties and guarantees in this Agreement shall continue to apply even after Final Payment by the City.)

Article 5. Appropriation of Funds

Notwithstanding any other provision of this Agreement, if funds for the continued fulfillment of this Agreement by the City are at any time not forthcoming or are insufficient, through failure of any entity, including the City itself, to appropriate funds or otherwise, then the City shall have the right to terminate this Agreement without penalty.

Article 6. Performance and Payment Bond

Contractor shall, within 10 days of the approval of this Agreement by the Common Council of the City of Sheboygan, provide the City with a Performance Bond and a Payment Bond in a format acceptable to the City's Representative, in the amount of 100% of the contract amount.

Failure by Contractor to perform the work in a timely or satisfactory fashion may result in forfeiture of Contractor's Performance Bond. Failure by Contractor to make necessary payments to suppliers or subcontractors may result in forfeiture of Contractor's Payment Bond.

If the Surety on any bond furnished by Contractor becomes a party to supervision or liquidation, or its right to do business in the State of Wisconsin is terminated, Contractor shall, within 30 calendar days thereafter, substitute another bond or surety, both of which must be acceptable to the City.

Article 7. Schedule

The City recognizes that the generator to be installed has a lead time of approximately 40 weeks as of the effective date of this Agreement.

Within 30 days of approval of this Agreement by the Common Council of the City of Sheboygan, Contractor and the City's Representative shall develop a schedule, which may be amended by written agreement of Contractor and the City's Representative.

Contractor shall begin the Services as soon as is practicable upon receiving a Notice to Proceed from the City's Representative, and shall continue the prosecution of the Services as quickly as is practicable until the Services are completed.

Failure of the Contractor to adhere to the schedule as specified or to promptly replace rejected materials shall render the Contractor liable for all costs in excess of the contract price when alternate procurement is necessary. Excess costs shall include the administrative costs and other costs attributable to the delay.

No work aside from that performed during the regular work week (6:30 a.m. to 5:00 p.m.) will be allowed unless prior notice is given to the City's Representative and the City's Representative consents to the work being performed during that time. Any work performed without prior notice and approval to do so may be required to be removed for inspection at Contractor's expense.

Article 8. Workmanship and Quality of Materials
Contractor shall ensure that the System has the following warranties, which begin after Final Acceptance and completion of all training required in the Project Manual:

- All equipment purchased as a result of this Agreement shall include the equipment manufacturer's standard warranty.
- Contractor shall provide a one-year warranty against defects for parts and labor.

All material shall be new, newest model year, and free from defects. Items which are used, demonstrators, obsolete, seconds, or which have been discontinued are unacceptable without prior written approval of the City's Representative.

Whenever, in any document, an article, material, or equipment is defined by describing a proprietary product, or by using the name of a manufacturer or vendor, the term "or equal" or the term "the equivalent" if not inserted, shall be implied, and it is done for the express purpose of establishing a basis of durability and efficiency and not for the purpose of limiting competition. Whenever material or equipment is submitted for approval as being equal to that specified, the submittal shall include sufficient information and data to demonstrate that the material or equipment conforms to all contractual requirements. The decision as to whether or not such material or equipment is equal to that specified shall be made by the City's Representative. The approval by the City's Representative of alternate material or equipment as being equivalent to that specified shall not in any way relieve Contractor of responsibility for failure of the material or equipment due to faulty design, material, or workmanship, to perform the function required by the contract documents. The City's Representative shall be the sole and final judge of equivalency.

Article 9. Safety Requirements
All materials, equipment, and supplies provided to the City must comply fully with all safety requirements set forth under state and federal law, including all applicable OSHA Standards.

Contractor shall be responsible for the safety of employees at all times and shall provide all equipment necessary to insure their safety. Contractor shall ensure the enforcement of all applicable safety rules, regulations, ordinances and laws, whether federal, state, or local.

Contractor shall provide the necessary safeguards including, but not limited to, warning signs and barricades, to avoid all necessary hazards and protect the public, the work, and the property at all times, including on days when no work is being done. The City shall not be responsible for any loss or damage to the project materials prior to their installation or to Contractor's tools and equipment from any cause whatsoever.

Contractor's Superintendent of Safety shall make daily inspections upon the arrival and leaving of the site at the close of each workday.

Article 10. Access to Records
Both parties understand that the City is bound by the Wisconsin Public Records Law and, as such, this contract is subject to that law. Contractor acknowledges that it is obligated to assist the City in

retaining and producing records related to the contract, and that the failure to do so shall constitute a material breach of the contract, in which case Contractor must defend and hold the City harmless from liability under that law.

Contractor shall maintain all records related to this contract for a period of not less than 7 years after receipt of Final Payment under the Agreement, except in the event of litigation or settlement of claims arising from the performance of this Agreement, in which case records shall be maintained until the disposition of all such litigation, appeals, claims, or exceptions related thereto.

Article 11. Termination

The City may terminate or suspend performance of this Agreement at the City's prerogative at any time upon written notice to Contractor. The City's Representative shall have the authority to provide this written notice. Contractor shall terminate or suspend performance of the Services on a schedule acceptable to the City and the City shall pay Contractor for all the Services performed up to the date that written notice is received, plus reasonable termination or suspension expenses. Upon restart, an equitable adjustment shall be made to Contractor's compensation and the schedule of services.

If the City fails to make payment through no fault of the Contractor for a period of 30 days after such payment is due in accordance with the Contract Documents, the Contractor may, upon 7 days written notice to the City, terminate the Agreement and recover from the City payment for all work executed and for any proven loss sustained upon any materials, equipment, tools, and construction equipment and machinery, including reasonable profit and damages.

If Contractor defaults or fails to fulfill in a timely and proper manner its obligations pursuant to this Agreement, the City may, 10 days after written notice has been delivered to Contractor, and without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due to Contractor. In the alternative the City may, at its option, terminate this Agreement and take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by Contractor, and may finish the project by whatever method it may deem expedient. In case the expenses incurred by the City (including payments previously made to Contractor) shall be less than the sum which would have been payable under the Agreement if it had been completed by Contractor, Contractor shall be entitled to receive the difference. However, in case such expense shall exceed the sum which would have been payable under the Agreement, Contractor will be liable and shall pay to the City the amount of said excess. By taking over prosecution of the work, the City does not forfeit the right to recover damages from Contractor or its surety, for failure to complete the work or for defects in the work.

For the avoidance of doubt, the specific remedies identified in this Article 11 are not exclusive. In other words, the City may pursue any remedy in law or equity in the event that Contractor defaults under this Agreement.

Article 12. Default

If Contractor breaches this Agreement or fails to perform the work in an acceptable manner, it shall be considered in default. Any one or more of the following will be considered a default:

- Failure to begin the work under this Agreement within the time specified.
- Failure to perform the work with sufficient supervision, workers, equipment and materials to ensure prompt completion of said work within the time limits allowed.
- Unsuitable performance of the work as determined by City.
- Neglecting or refusing to remove defective materials or failure to perform anew such work as shall have been rejected.
- Discontinuing the prosecution of the work or any part of it.
- Inability to finance the work adequately.
- If, for any other reason, Contractor breaches this Agreement or fails to carry on the work in an acceptable manner.

The City shall send Contractor a written notice of default. If Contractor, within a period of 10 days after such notice, fails to remedy the default, then the City shall have full power and authority, without violation of the Agreement, to take the prosecution of the work out of the hands of Contractor, as set forth in this Agreement.

Article 13. Identity of Contractor

Contractor acknowledges that one of the primary reasons for its selection by the City to perform the Services is the qualifications and experience of Contractor. Contractor thus agrees that the Services to be performed pursuant to this Agreement shall be performed by Contractor. Contractor shall not subcontract any part of the Services without the prior written permission of the City[2]. The City's Representative shall have the ability to provide this written permission. The City reserves the right to reject any of the Contractor's personnel or proposed outside professional sub-consultants, and the City reserves the right to request that acceptable replacement personnel be assigned to the project.

Article 14. Independent Contractor Status

During the entire term of this Agreement, Contractor shall be an independent contractor, and in no event shall any of its personnel, agents or subcontractors be construed to be, or represent themselves to be, employees of the City. Contractor shall be solely responsible for the payment and reporting of all employee and employer taxes, including social security, unemployment, and any other federal, state, or local taxes required to be withheld from employees or payable on behalf of its employees.

Article 15. Indemnification

Contractor is responsible to the City for the acts and omissions of its employees, subcontractors, and any other persons performing any of the work under a contract with Contractor.

As such, to the extent permitted by law, Contractor shall defend and hold the City—including its Officials, Agents, and Employees—harmless from all liability, including, but not limited to, claims, actions, causes of action, liens, losses, damages, costs, legal fees, expenses, or judgments resulting

[2] In the event that the City allows part of the Services to be subcontracted, Contractor shall still be fully responsible to the City for the acts or omissions of any subcontractor and anyone employed directly or indirectly by the subcontractor. This is in addition to any liability imposed by law upon the Contractor.

from claimed injury, death, damage to property, or loss of use of property or any person or legal entity arising out of or in any way connected with the performance of work or work to be performed under this Agreement.

For the avoidance of doubt, this obligation to defend and hold the City harmless applies—among other instances—if the claimed liability arises out of:

- A violation of any law, ordinance, regulation, order, or decree by the Contractor, its employees, subcontractors, or any other person performing any of the work under a contract with Contractor.
- The failure on the part of Contractor, its employees, subcontractors, or any other person performing any of the work under a contract with Contractor, to complete any of the covenants, acts, matters, or things assigned to them under this Agreement.

Contractor shall reimburse the City for any costs, expenses, judgments, and legal fees paid or incurred, by or on behalf of the City, its Officials, Agents, or Employees, or paid for on behalf of the City, its Officials, Agents, or Employees by insurance purchased or self-insurance provided by the City.

For the avoidance of doubt, Contractor shall further hold the City, its Officials, Agents, and Employees harmless from liability or claims for any injuries to or death of Contractor's employees (or the employees of any authorized subcontractor) arising out of or in any way connected with the work or work to be performed under this Agreement, including protection against any claim of the contractor or subcontractor for any payments under any worker's compensation law or any expenses of or any payments made by any worker's compensation insurance carrier on behalf of said contractor or sub-contractor, and the contractor shall hold the City harmless from any costs, expenses, judgments, and attorney's fees with respect to any above referenced workers' compensation claims incurred or paid by the City or paid on its behalf or on behalf of its Officials, Agents, or Employees by insurance purchased or self-insurance provided by the City.

Article 16. <u>Insurance</u>

Contractor shall not commence work under this Agreement until it has obtained all insurance required under this Article. Additionally, Contractor shall not allow any approved subcontractor to commence work on its subcontract until the subcontractor has obtained all insurance required under this Article.

During the performance of any and all Services under this Agreement, Contractor shall maintain the following insurance in full force and effect, and shall provide proof of insurance to the City's Representative listing the City of Sheboygan as an additional insured:

a. Unemployment and Social Security – Contractor shall acquire and maintain, for the duration of the Agreement, Unemployment and Social Security Insurance that meets all statutory requirements.

b. Workers' Compensation Insurance – Contractor shall acquire and maintain, for the duration of the Agreement, Workers' Compensation Insurance that meets all statutory requirements.

c. Commercial General Liability and Property Damage Insurance – Contractor shall acquire and maintain, for the duration of this Agreement, Commercial General Liability Insurance with a policy limit of at least $2,000,000 per occurrence and $2,000,000 in the aggregate. The Commercial General Liability Insurance shall include operations, contractor's protective insurance, products coverage, completed operations, contractual coverage, underground coverage, and blasting, explosion, and collapse.

d. Comprehensive Automobile Liability and Property Damage – Contractor shall acquire and maintain, for the duration of this Agreement, Comprehensive Automobile Liability and Property Damage Insurance that covers the operation of owned, hired, and non-owned motor vehicles with a policy limit – for liability, bodily injury, and property damage – of at least $1,000,000 per occurrence and $1,000,000 in the aggregate.

The proof of insurance referenced above shall require the insurance company to notify the City at least 30 days prior to the expiration, cancellation, non-renewal, or material change in the coverage. The Certificate Holder on the proof of insurance should be listed as:

City of Sheboygan, Wisconsin
828 Center Ave., Suite 110
Sheboygan, Wisconsin 53081

The proof of insurance must contain an original signature.

Approval of the insurance by the City's Representative shall not relieve or decrease the extent to which Contractor may be held responsible for payment of damages resulting from Contractor's provision of the Services or its operations under this Agreement. If Contractor fails or refuses to procure or maintain the insurance required by these provisions, or fails or refuses to furnish the City the required proof that the insurance has been procured and is in force and paid for, the City shall have the right at its election to terminate the Agreement.

Article 17. Conflict of Interest
Contractor declares that it has no present interest, nor shall it acquire any interest, direct or indirect, which would conflict with the performance of Services under this Agreement. Contractor agrees that no person having any such interest shall be employed in the performance of this Agreement.

Article 18. Waiver
No failure of either party to enforce a term of this Agreement against the other shall be construed as a waiver of that term, nor shall it in any way affect the party's right to enforce that term. No waiver by any party of any term of this Agreement—which may only occur in writing—shall be considered to be a waiver of any other term or breach thereof.

Article 19. Severability
The invalidity, illegality, or unenforceability of any provision of this Agreement or the occurrence of any event rendering any portion or provision of this Agreement void shall in no way affect the validity or enforceability of any other portion or provision of this Agreement. Any void provision shall be

deemed severed from this Agreement, and the balance of the Agreement shall be construed and enforced as if it did not contain the particular provision held to be void. The parties further agree to amend this Agreement to replace any stricken provision with a valid provision that comes as close as possible to the intent of the stricken provision. The provisions of this Article shall not prevent this entire Agreement from being void should a provision which is of the essence of this Agreement be determined void.

Article 20. Assignment
Neither the City nor Contractor shall assign any rights or duties under this Agreement without the prior written consent of the other party. Such written approval by the City shall not relieve the Contractor of the obligations incurred by the Contractor under the terms of this Agreement.

Article 21. Third Party Rights
Nothing in this Agreement shall be construed to give any rights or benefits to anyone other than the City and Contractor.

Nothing in this Agreement shall create any contractual relationship between any subcontractor and the City. Contractor agrees to bind every approved subcontractor (and every subcontractor of a subcontractor) by the terms of this Agreement as far as applicable to that subcontractor's work, unless specifically noted to the contrary in a subcontract approved in writing as adequate by the City. The City's Representative shall have the authority to consent to a subcontract as being adequate.

Article 22. Governing Law and Venue
This Agreement shall be governed by the laws of the State of Wisconsin. Venue of any disputes arising under this Agreement shall be in the Sheboygan County Circuit Court, Wisconsin.

Article 23. Non-Discrimination and Equal Opportunity
In connection with the performance of work under this Agreement, Contractor agrees not to discriminate against any employee or applicant for employment because of age, race, religion, color, handicap, sex, physical condition, disability, developmental disability (as defined in Wis. Stat. 51.01(5)), sexual orientation (as defined in Wis. Stat. 111.32(13m)), gender identity, or national origin. This provision shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

Contractor further agrees to take affirmative action to ensure equal employment opportunities.

Article 24. Compliance with Laws
In performing the Services under this Agreement, Contractor shall comply with any and all applicable federal, state, and local statutes, ordinances, plans, and regulations.

The City reserves the right to cancel this Agreement if Contractor fails to follow the requirements of Wis. Stat. 77.66 and related statutes regarding certification for collection of sales and use tax. The City also reserves the right to cancel this Agreement with any state or federally debarred contractor.

Contractor shall have any and all licenses and permits required to perform the work specified, and shall furnish proof of such licensing authorization and permits upon request.

Article 25. Notices
Any notice required by this Agreement shall be made in writing to the individuals/addresses specified below:

City: **Contractor:**

City Clerk		
City of Sheboygan		
828 Center Ave.		
Sheboygan, Wisconsin 53083		

Nothing contained in this Article shall be construed to restrict the transmission of routine communications between representatives of the City and Contractor.

Article 26. Intent to be Bound
The City and Contractor each binds itself and its successors, executors, administrators, permitted assigns, legal representatives and, in the case of a partnership, its partners to the other party to this Agreement, and to the successors, executors, administrators, permitted assigns, legal representatives and partners of such other party in respect to all provisions of this Agreement.

Article 27. Force Majeure
Neither party shall be in default by reason of any failure in performance of this Agreement in accordance with reasonable control and without fault or negligence on their part. Such causes may include, but are not restricted to, acts of nature or the public enemy, acts of the government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather. In every case, the failure to perform must be beyond the reasonable control and without the fault or negligence of the party.

Article 28. Integration and Modification
This Agreement may be modified only by a written amendment signed by both parties hereto.

This Agreement consists of the following parts, each of which is as fully a part of this Agreement as if fully set out herein:

1. This Agreement and its Exhibits
2. Any Written Amendment to the Agreement which may be delivered or issued after the Effective Date of the Agreement (including Change Orders)
3. The Request for Bids (including all attachments)
4. The Plan Set for Request for Bids 2005-21
5. All Addenda to the Request for Bids
6. All Other Submittals by Contractor
7. The Performance and Payment Bonds

(collectively "the Contract").

This Contract is the entire and integrated agreement between the City and Contractor regarding the subject matter of this Contract. It supersedes all prior and contemporaneous communications, representations and agreements that are not part of this Contract.

In resolving conflicts, errors, discrepancies and disputes concerning the Scope of Work to be performed by Contractor, the document expressing the greater quantity, quality, or other scope of work in question, or imposing the greater obligation upon Contractor and affording the greater right or remedy to the City shall govern. Otherwise, the documents shall be given precedence in the order set forth above.

Article 29. Non-Collusion

Contractor is certifying, under penalty of perjury, that to the best of its knowledge and belief:

1. The prices in its bid were arrived at independently, without collusion, consultation, communication, or agreement for the purpose of restricting competition as to any other matter relating to such prices with any other bidder, or with any other competitor.
2. The prices quoted in its bid were not knowingly disclosed—directly or indirectly—by the bidder prior to bid opening.
3. No attempt was made to induce any other person, partnership, or corporation to submit or not submit a bid for the purpose of restricting competition.

Article 30. Other Provisions

1. Material Safety Data Sheet. If any item(s) on an order(s) resulting from this Agreement is a hazardous chemical, as defined under 29 C.F.R. 1910.1200, Contractor shall provide one (1) copy of a Material Safety Data Sheet for each item with the shipped container(s) and one (1) copy with the invoice(s).

2. Advertising and News Releases. Reference to or use of the City, or any of its departments, officials, or employees, for commercial promotion is prohibited. News releases pertaining to this procurement shall not be made without prior approval of the City's Representative. Release of broadcast e-mails pertaining to this procurement shall not be made without prior written authorization of the City's Representative.

3. Foreign Corporation. A foreign corporation (any corporation other than a Wisconsin corporation) which becomes a party to this Agreement is required to conform to all the requirements of Wis. Stat. 180 relating to a foreign corporation, and must possess a certificate of authority from the Wisconsin Department of Financial Institutions, unless the corporation is transacting business in interstate commerce or is otherwise exempt from the requirement of obtaining a certificate of authority.

4. Authority. Each person executing this Agreement on behalf of a party hereto represents and warrants to the other party: That the execution and delivery of this Agreement has been duly authorized, that the person or persons executing this Agreement have the full power, authority, and right to do so, and that such execution is sufficient and legally binding on such party to enable this Agreement to be enforceable in accordance with its terms.

5. Intellectual Property. Contractor shall pay for any royalties and license fees associated with intellectual property used in the completion of the Services. Contractor shall defend any suits or claims for infringement of any intellectual property rights related to the completion of the Services, and shall hold the City harmless from any liability associated with any such suit or claim.

6. Intent of Contract Documents.

    a. The intent of this Agreement is to include in the contract price the cost of all labor and materials, water, fuel, tools, plants, equipment, light, transportation, and any other expenses that may be necessary for the proper execution and completion of the work included in the Agreement.

    b. In interpreting the Agreement, words describing materials that have a well-known technical or trade meaning shall be construed in accordance with such well known meanings unless otherwise specifically defined.

7. Definitions.

    a. Final Acceptance: The event that occurs when Contractor issues to the City or the City issues to Contractor a written statement that Contractor has completed all Punch List items, has made all necessary submittals to the City, and has satisfied all of its obligations under the Agreement.

    b. Final Inspection: The inspection conducted by the City to determine what work must still be completed by Contractor in order for Completion of the Services to occur. After the Final Inspection, the City shall provide Contractor with a Punch List that Contractor must complete in order for Completion of the Services to occur.

c. Final Payment: Payment by the City to Contractor after Completion of the Services the result of which is Contractor receiving all payments due under the terms of the Agreement for performing and completing the Services.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed the day and year first written above.

CITY OF SHEBOYGAN, WISCONSIN	**CONTRACTOR**
BY: _____ Ryan Sorenson, Mayor	**BY:** _____
ATTEST: _____ Meredith DeBruin, City Clerk	**ATTEST:** _____
DATE: _____	**DATE:** _____

Approved by Res. No. _____-21-22.

EXHIBIT 1

CITY OF SHEBOYGAN
PUBLIC WORKS

City of
Sheboygan
spirit on the lake.

CITY OF SHEBOYGAN WISCONSIN

Municipal Service Building
Generator and Service Replacement Project

2026 New Jersey Avenue
Sheboygan, WI 53081

October 15, 2021

MSA

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CITY OF SHEBOYGAN
MUNICIPAL SERVICE BUILDING
2026 New Jersey Avenue
Sheboygan, WI 53081

ADVERTISEMENT FOR BID

The City of Sheboygan, Sheboygan, Wisconsin will receive sealed bids until 1:00 p.m. on Thursday, November 18, 2021 for the City of Sheboygan Municipal Service Building Generator and Service Replacement project located at 2026 New Jersey Avenue, Sheboygan, WI 53081. Bids will be opened at 1:00 p.m. at Sheboygan Municipal Building at 2026 New Jersey Avenue, Sheboygan, Wisconsin. This work is to include replacing the existing generator, transfer switches, main service disconnect/CT, existing outdated panelboards and rewiring the facility to comply with the latest emergency egress lighting code. Drawings and specifications will be available from Great Lakes Blueprinters, Inc. on Monday October 17, 2021.

MSA Professional Services will be performing a one-time mandatory pre-bid walkthrough for all contractors bidding this project. This walkthrough will be performed at Municipal Service Building on Wednesday October 27, 2021 at 8:00 a.m. All contractors shall meet in the main lobby of the Municipal Service Building.

Instructions to bidders, bid form, general conditions of the contract, specifications, and contract drawings are included as part of the specification manual. No bid may be withdrawn after the hour set for the opening of bids nor prior to the award of the contract. Bid and Performance Bonds will be required.

In order to be considered, all bidders must have a completed Bidders Proof of Responsibility on file the City of Sheboygan Engineering Department not less than five days prior to the bid due date. Bids received from firms not having an approved Bidders Proof of Responsibility on file will not be opened. Forms are included with the bid documents.

The City of Sheboygan reserves the right to reject any or all bids, in whole or in part or combination thereof, to waive any informality in bidding, or to accept any bid deemed to be most advantageous to the Board or redo the bidding process when deemed necessary.

Bids shall remain valid for sixty (60) days after the bid opening. Published by the Authority of the City of Sheboygan, Sheboygan, Wisconsin.

Bid documents will be distributed through:
Great Lakes Blueprinters, Inc.
Address: 1223 N 8th St., Sheboygan, WI 53081
Phone: (920) 458-3676
https://www.greatlakesblueprinters.com

PART I - INSTRUCTIONS TO BIDDERS

1. PREPARATION OF BIDS

Proposals to receive consideration must be submitted only on the proposal form provided herein.

All proposals shall be submitted in a sealed envelope, indicating bid project name, which is addressed to the City of Sheboygan, to arrive not later than the day and time noted in the advertisement for opening bids, and no proposal received after that time will be given consideration. No faxed or emailed bids will be considered.

2. AWARD OR REJECTION OF BIDS

The City of Sheboygan reserves the right to reject any or all bids, in whole or in part or combination thereof, to waive any informality in bidding, or to accept any bid deemed to be most advantageous to the Board. No bid may be withdrawn after the hour set for the opening of bids nor prior to the award of contract. It is anticipated that this contract will be awarded on December 21, 2021.

3. KNOWLEDGE OF SPECIFICATION

It shall be the sole responsibility of each bidder to familiarize himself with the specifications. Failure to comply in this condition does not relieve bidder from obligations with respect to his bid on award of contract. Bidder may submit an alternate bid on an alternate manufacturer(s) as listed on specifications.

4. ERRORS AND CORRECTIONS IN SPECIFICATIONS

Any bidder finding errors or omissions in the bid form and specification sheet shall request clarification or interpretation of the discrepancy prior to his bidding. Failure to request such clarification or interpretation shall be sufficient cause to reject the bid on that item. Addendums will be issued to correct errors or omissions if deemed necessary by the owner.

5. SUBSTITUTED EQUIPMENT SAMPLE

Equipment on which you submit a bid must be available for inspection by the City of Sheboygan, or designee, within 48 hours after notice is given for that purpose. Where samples of the equipment are not available, complete specifications, along with cuts, photos, and any other descriptive literature must be supplied to the satisfaction of the owner. Failure to satisfy this request shall be considered sufficient cause for rejecting the bid on that item.

6. **SIGNATURE OF BIDDERS**

The duly authorized person of the firm submitting the bid must sign in longhand the bid agreement form.

7. **SPECIAL MENTION**

A. It is specifically requested that salesmen and dealers are not to contact the City of Sheboygan members and members of the administrative staff individually. In the event there are questions regarding specifications, the contractor should contact Dave Schulze of MSA Professional Services at (920) 894-4710 or dschulze@msa-ps.com.

B. Sales Tax – Owner Purchase Items:

1. As a tax- exempt body, the contractor will purchase the materials on the owner's behalf (as indicated on bid form) directly from the manufacturer/supplier to save the 5% sales tax (and the county tax if applicable). Bidders are to include the materials, without sales tax and applicable county taxes, in their bid.
2. The "installation" portion of the bid is to include installation of the "tax exempt" items plus all labor, material, overhead, and profit necessary to complete the project as defined by the drawings and specifications. All applicable taxes are not to be included. Bid and performance bonds as required in the Instructions to Bidders must be included on this portion of the work.

8. **DATE OF COMPLETION**

Work for this project shall start as soon as practicable following contract execution. The final completion date will be mutually agreed upon between the parties.

9. **WORKING HOURS**

Work hours shall be 6:30 a.m. to 5:00 p.m. Monday through Friday unless pre-approved otherwise by the Owner. If additional hours are necessary to complete the project in the set time period, this will be coordinated with the owner to allow the contractor to work around the City of Sheboygan schedule. Contractor must be completed with project on date set in specifications and include overtime in bid if required. No additional compensation will be allowed for overtime for contractor to complete project within set time period.

10. **GENERAL**

The contractor, before submitting his proposal, shall visit the premises and familiarize himself with the work which is intended to be done under this specification, which is to form a part of the contract, and all work is to be done strictly in conformity therewith. No one shall visit the building without proper authorization from the owner.

11. CONTRACTOR'S INSURANCE

Contract shall not commence work under this contract until he has obtained, at his own expense, all insurance required under this article.

A. Unemployment and Social Security: As required by all existing laws as amended to date.

B. Compensation Insurance in strict compliance with existing laws as amended to date.

C. Public Liability and Property Damage: Take out and maintain during life of this contract, in the amount listed hereunder, for the protection of himself and any subcontractor performing work covered by the contract from claim for:

1. Damages for personal injury, including accidental death and for property damages which may arise from operations of the contract, whether such operations be by himself or by any subcontractor or anyone directly or indirectly employed by either of them. Operations to include products and completed operations.
2. Contractor to indemnify and save the owner and the engineer harmless from any and all claims, demands, suits, actions, proceedings, loss, costs and damages of every kind and description which may be brought to or made against the aforementioned due to prosecution of the contract. The insurance policy is to include coverage for this contractual obligation.

COMPREHENSIVE GENERAL LIABILITY	LIMIT OF LIABILITY
Personal Injury - Each occurrence	$1,000,000
Aggregate	$1,000,000
Property Damage - Each occurrence	$100,000
Aggregate	$300,000

a. Regarding Property Damage - include Broad Form Property Damage, remove explosion, collapse, and underground property damage exclusions.

b. Comprehensive Automotive Bodily Injury Liability and Property Damage Liability insurance covering the contractor's legal liability for the ownership, operation, maintenance or use of any vehicle in connection with this project will be provided by each contractor:

BODILY INJURY AND PROPERTY DAMAGE LIABILITY	
Each occurrence	$500,000

D. Certificate of Insurance: Shall be submitted in duplicate to owner by underwriters immediately prior to the execution of contract, bearing name of contractor, name of insurance company, type of insurance, policy number, effective dates, the expiration date, the limits of liability, and a description of the operations to which coverage applies. Certificate is to clearly indicate that all coverages as indicated above are included. Certificate must list the **City of Sheboygan** as additionally insured.

E. In the event of policy cancellation, notice of cancellation or material change must be mailed to owner at least thirty (30) days prior to cancellation.

12. BUILDER'S RISK INSURANCE

A. The owner shall, at its sole option procure and maintain Builder's Risk Insurance in the name of the owner. This insurance coverage will be $1,000 deductible and will be for the perils of fire and extended coverage.

B. The owner may, at his option, carry such additional perils of coverage and/or theft insurance as he may deem necessary to protect the work, equipment and property. This insurance will not cover equipment such as tools, sheds, hoists, canvasses, tarpaulins, mixers, scaffolding, staging and towers owned or rented by a contractor.

C. If contractor desires to carry coverages which the owner options not to carry, he may do so at his own expense.

D. The carrying or not carrying of coverage by the owner shall not be construed as an act relieving the contractor of any of his legal or financial responsibility for damage or loss to the work, equipment or property.

E. If the contractor carries any coverage, he hereby waives all rights of subrogation that he may later obtain against owner for any loss covered under such policies.

F. The contractor shall be responsible and pay for the first $1,000 of each loss related to this contract.

13. QUALIFICATIONS OF BIDDER

A. All prime contractors are required to have on file an approved Bidders Proof of Responsibility not less than 5 days prior to the bid due date. The Bidders Proof of Responsibility form is included in the bid documents.

B. Bidder may be required to furnish names of projects in the area (reasonable) for inspection or reference.

C. Failure to comply with A & B above may result in rejection of the bid.

14. EVALUATION OF BIDS

A. The owner can consider factors such as completion date, financial stability, and experience as factors in awarding the bid.

B. Owner may accept or reject any or all bids that are not deemed to be in its best interest.

15. AMENDMENT OF SPECIFICATIONS

A. The owner reserves the right to amend this document in addendum prior to the date set for receipt of bids. Copies of addendum will be furnished to all registered contractors. It will be the responsibility of the bidder to acknowledge this addendum.

16 BID BOND

A. Bid Bond shall be required of all bidders. The bid bond shall be issued by a surety company licensed to do business in Wisconsin or in lieu of a bond a cashier's check shall be made out to the Owner for 5 percent of the total bid amount. The bid bond or cashier's check shall be included with the bid when the bid is submitted to the Owner to protect the Owner from loss incurred if:
   1. the accepted bidder withdraws the bid or
   2. the accepted bidder fails to enter into a performance contract with the Owner.

17. PERFORMANCE AND PAYMENT BONDS

The contractor must provide performance and payment bonds in an amount not less than one hundred percent (100%) of the total contract cost prior to the start of work. (see separate attachment form).

18. TOURING OF BUILDINGS

There will be a one-time Mandatory walk-through for all contractors bidding this project. Bids received from contractors not in attendance will not be opened.

PART II - GENERAL CONDITIONS OF THE CONTRACT

1. DEFINITIONS

A. Bidder is the firm submitting price for work on bid proposal form.

B. Owner's representative is that individual designated by the City of Sheboygan to monitor work, and may be the Superintendent Facilities and Traffic Division or his representative as designated at the pre-construction meeting.

C. Final completion date is defined as the date when all work is complete including punch list a project is ready for final payment.

2. SPECIFICATIONS AS CONTRACT

The rules regarding related work, materials used, and required conditions stated within this specification are considered complete and binding unless written addendum is issued by the owner to change such rules. The specifications are intended to be fair to qualified bidding parties, and are expressly written in the best interest of providing an excellent project for the City of Sheboygan.

3. RESPONSIBILITY OF CONTRACTOR

A. The contractor shall be responsible for damage to any part of the building or grounds that is a direct result of completing work. He shall be required to make repairs that meet with the satisfaction of the owner prior to final payment.

B. Contractor will comply with state, federal, local laws and rules designated by the owner pertaining to safety regulations. He is also to comply with safety regulations as specified by OSHA.

C. The contractor shall indemnify and hold harmless the owner from any liability or cost including attorney's fees based upon accidents on the premises during work resulting in bodily injury, including death, and/or any damage to equipment or property of the contractor.

D. The work shall not interfere with ongoing operations in the building or around the area. If work presents a threat of injury to any occupant or pedestrian, contractor shall provide ample warning and locate personnel on the grounds to inform people who could be injured.

4. ASBESTOS

A. The Municipal Service Building was constructed in the 1960's. As such there may be asbestos containing materials present in the building. The equipment to be removed and replaced is not believed to contain asbestos materials however asbestos may be present in certain areas of the building adjacent to the work to be performed under the contract.

B. Should the Contractor during the performance of the work, encounter materials that are suspected to contain asbestos the contractor should immediately contact the City's project manager.

C. Should testing or removal of the materials be required, the City will contract with the appropriate resources outside of the contract for replacement of the generator and electrical service equipment.

5. WORK CREW

A. Incompetent employees or employees whose on-site actions are not in the best interest of the owner in their opinion will be removed from the project upon notification of the contractor's superintendent.

B. There will be no discrimination against any employee or applicant for employment because of age, sex, or creed. Contractor may be asked to provide reasonable certification to prove that he is an equal opportunity employer.

C. Contractor will be expected to carry out work in a professional workmanlike manner and keep premises clean within reason. If owner's representative feels that work is contrary to what is considered professional and workmanlike, he will immediately notify the project superintendent. If action is not taken to correct work, the owner reserves the right to stop work and pay contractor for only that percentage of work completed.

6. PERMITS

Any permits and licenses necessary by local or state ordinances shall be secured at the expense of the contractor. The City of Sheboygan does not waive permit fees for City of Sheboygan Projects.

7. SPECIFICATIONS

A. All work shall be done in accordance with these specifications. If there are questions regarding a particular part of these, contact the owner at least seven days prior to bidding. Deviations shall not be considered after this time unless there is a discrepancy that requires changing to uphold the best interest of the project.

B. There are dimensions on the drawings; however, figuring material quantities is solely the responsibility of the contractor. Measurements should be double checked as the owner will not be responsible for any shortages or overruns because of a discrepancy of a measurement on the drawings.

8. **CLEAN UP**

Before the work is considered complete, all debris related to the project will be cleaned up to the satisfaction of the owner. All impaired grounds or damages to property or building shall be corrected.

9. **GUARANTEE**

A. At the completion of the project, the contractor, owner, and engineer shall inspect the work. Any deficiencies noticed at this point shall be upgraded by the contractor to the satisfaction of the owner.

B. The contractor, in writing, will warrant that for a period of (1) year from date of completion of job, without charge and within reasonable time after written notice, replacement of any material which is defective or which has been improperly applied and make any repairs necessary because of defects in said materials or workmanship.

10. **PAYMENTS**

Contractor should apply in writing for progress payments as work progresses by the first day of each month. The owner shall allow payments based on satisfactory inspection of that portion of completed work applied for. The owner reserves the right to hold payment until satisfactory completion, including clean up of project. Final payment for the entire job will be made only after the job has been inspected by the engineer, and found to be complete and satisfactory.

11. **SMOKING, ALCOHOL & DRUG USE**

There shall be NO smoking within the facility nor use of alcohol or drugs on the grounds at any time. Any use of these materials will be cause for immediate removal of the individual from the project site.

12. **SECURITY**

The contractor will be required to schedule any activity within the building for this contract with Mr. Michael Willmas the Superintendent Facilities and Traffic Division or his representative.

13. **PREVAILING WAGE RATE DETERMINATION**

Prevailing wage rates are not required for this project.

PART III - GENERAL REQUIREMENTS

1. STORAGE OF MATERIALS

A. Contractor shall be responsible for coordinating delivery and off-loading of materials including direct owner purchased equipment.

B. Storage and set up locations should be agreed upon by City of Sheboygan representative.

2. PROGRESS SCHEDULE

A. After award of contract, contractor will provide the owner with a progress schedule of planned work.

B. Schedule to include starting and estimated completion dates.

3. CONSTRUCTION MEETINGS

A. Pre-Construction Meeting will be scheduled by the engineer.

B. Agenda will include:
1. Submittal of insurance certificate.
2. Submittal of performance bond for labor portion of the bid.
3. Execution of owner-contractor agreement.
4. Distribution of contract documents.
5. Designation of responsible personnel.
6. Review of project and schedule.
7. Authorization badges and project security.

4. PROGRESS REPORT

A. The engineer will perform a site visit during this project and will submit a report to the owner. This shall be based on a minimum of one site visit during the project. The electrical contractor shall inform the engineer approximately two days in advance of when it would be best to perform this site visit or if he has any questions or concerns. He shall contact MSA Professional Services at (920) 894-7800.

5. FINAL INSPECTION

A. Attended by contractor, engineer and City of Sheboygan representative.

B. Agenda
   1. Walk through.
   2. Identification of problems that could impede warranty.
   3. Time frame for correction of problems.

6. MATERIALS

All materials specified shall be standard. Materials submitted for alternates will have to meet standards set in performance tests/value lists. Alternative manufacturer will be expected to monitor work, schedule job meetings, and guarantee project as previously stated.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, That _____ (a corporation) (individual) (partnership) of the State of _____ (hereinafter referred to as the "Principal", and _____, (Name of Surety) a corporation of the State of _____, (hereinafter referred to as the "Surety"), are held and firmly bound unto _____(hereinafter referred to as the "Obligee"), in the penal sum of five percent (5%) of the amount of the total bid or bids of the Principal herein accepted by the Obligee, for the payment of which the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that, whereas the Principal has submitted, or is about to submit, to _____ (Owner) a certain bid, including the related alternate and combined bids attached hereto and hereby made a part hereof, to enter into a contract in writing for (Type of work) for the _____(Project).

(1) If said bid is rejected by the Obligee, then this obligation shall be void.

(2) If said bid is accepted by the Obligee and the Principal shall execute and deliver a contract in the form specified by the Obligee (properly completed in accordance with said bid) and shall furnish a bond for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connections therewith, and shall in all other respects perform the agreement created by the acceptance of said bid, then this obligation shall be void.

(3) If said bid is accepted by the Obligee and the Principal shall fail to execute and deliver the contract and the performance and payment bond noted in (2) above executed by this Surety, all within the time specified or any extension thereof, the Principal and Surety agree jointly and severally to forfeit to the Obligee the penal sum mentioned above, it being understood that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal sum of this obligation as stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by an extension of the time within which the Obligee may accept such bid, and said Surety does hereby waive notice of any such extension.

IN WITNESS THEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed, and these presents to be signed by their proper offices, on the day and year set forth below:

SEAL: _____ _____
(Principal) (Date)

BY: _____ _____
(Name of Surety) (Date)

NOTE TO SURETY AND PRINCIPAL:
The Bid submitted, which this Bond guarantees, may be rejected if the following instrument is not attached to this Bond: Power of Attorney showing that the agent of Surety is currently authorized to execute bonds in behalf of the Surety, and in the amounts referenced above.

PERFORMANCE-PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we _____ a _____ hereinafter call "Principal" and _____ of _____, State of _____, hereinafter called the "Surety", are held and firmly bound unto ____ hereinafter called "Owner" in the penal sum of _____ (Dollars) $_____ in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20__, a copy of which is hereto attached and made a part hereof for the construction of Rosalind Apartments Living Unit Relighting Project.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform his duties, all the undertakings, covenants, terms, conditions and extensions of said contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default and shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension of modification thereof including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alterations or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alterations or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be deemed an original, this _____ day of _____, 20___.

ATTEST:

_____	
(Principal) Secretary	Principal
CORPORATE SEAL	BY _____ (S)
_____	_____
Witness as to Principal	Address and Zip Code
_____	_____
Address and Zip Code	Surety
_____	BY _____
(Surety) Secretary	Signature of Attorney in Fact
CORPORATE SEAL	_____
	Typed or Printed Name of Attorney in Fact
	_____
	Address and Zip Code
_____	_____
Witness as to Surety	Telephone Number of Attorney in Fact
	_____
	Address and Zip Code

NOTE: Date of Bond must not be prior to date of Contract. The Company executing this bond and their authorized agent must be licensed to do business in Wisconsin. If Contractor is partnership, all partners shall execute bond.

BID PROPOSAL FORM

CITY OF SHEBOYGAN MUNICIPAL BUILDING GENERATOR AND SERVICE REPLACEMENT PROJECT

Bids Close: 1:00 p.m., Thursday, November 18, 2021

PROPOSAL

To: City of Sheboygan
Municipal Service Building
Attn: Mr. Bernard Rammer
2026 New Jersey Avenue
Sheboygan, WI 53081

We _____ (☐ a corporation) (☐ a partnership) (☐ an individual)
(Company name)

Of _____
Street City and State Zip Telephone No.

Hereby agree to execute contract and furnish satisfactory bond in the amount specified, and to furnish all labor and materials required to complete the project located in Sheboygan, Wisconsin, in strict accordance with the contract documents prepared by MSA Professional Services, Inc., and dated October 15, 2021.

BASE BID
We propose to furnish all permits, equipment, materials and labor, to include travel, lodging and other expenses to furnish and install a new emergency generator and electrical service and distribution panels in accordance with the bid plans and specifications for a turn-key installation.

Total Lump-Sum Cost $_____

Addendum Receipt

We acknowledge receipt of the following Addenda:

Addendum No. _____ Date _____

Addendum No. _____ Date _____

Addendum No. _____ Date _____

The undersigned agrees, if awarded the contract, to commence the contract work upon written notice and to complete the contract work within the times stated in the contract documents.

_____

Firm Name

_____

Attested (Corporate Secretary)

(Seal if Bid is by Corporation) By _____

Title _____

Dated _____, 20___

STANDARD TERMS AND CONDITIONS

1.0 SPECIFICATIONS: The specifications in this request are the minimum acceptable. When specific manufacturer and model numbers are used, they are to establish a design, type of construction, quality, functional capability and/or performance level desired, unless otherwise specified. When alternates are bid/proposed, they must be identified by manufacturer, stock number, and such other information necessary to establish an acceptable equivalency. The City shall be the sole and final judge of equivalency.

2.0 HOW TO AMEND A REQUEST FOR BID, PROPOSAL OR QUOTE:

2.1 Public Works Projects are subject to Wis Stats 66.0901(5): If a person submits a bid or proposal for the performance of public work under any public contract to be let by a municipality and the bidder claims that a mistake, omission or error has been made in preparing the bid, the bidder shall, before the bids are opened, make known the fact that an error, omission or mistake has been made. If the bidder makes this fact known, the bid shall be returned to the bidder unopened and the bidder may not bid upon the public contract unless it is re-advertised and relet upon the re- advertisement. If a bidder makes an error, omission or mistake and discovers it after the bids are opened, the bidder shall immediately and without delay give written notice and make known the fact of the mistake, omission or error which has been committed and submit to the municipality clear and satisfactory evidence of the mistake, omission or error and that it was not caused by any careless act or omission on the bidder's part in the exercise of ordinary care in examining the plans or specifications and in conforming with the provisions of this section. If the discovery and notice of a mistake, omission or error causes a forfeiture, the bidder may not recover the moneys or certified check forfeited as liquidated damages unless it is proven before a court of competent jurisdiction in an action brought for the recovery of the amount forfeited, that in making the mistake, error or omission the bidder was free from carelessness, negligence or inexcusable neglect.

2.2 Non-Public Work Projects: After a Request for Bid/Proposal/Quote has been filed with the City of Sheboygan Purchasing Department, the responder may submit an amended response BEFORE THE DUE DATE AND TIME set in the request. All the conditions and provisions of the original Bid/Proposal/Quote will be in effect. No submittals or amendments will be accepted after the due date and time of the request. This does not preclude the City from requesting additional information and/or clarification.

3.0 DEVIATIONS AND EXCEPTIONS: Deviations and exceptions from original text, terms, conditions, or specifications shall be described fully, on the bidder's/proposer's letterhead, signed, and attached to the request. In the absence of such statement, the bid/proposal shall be accepted as in strict compliance with all terms, conditions, and specifications and the bidders/proposers shall be held liable.

4.0 QUALITY: Unless otherwise indicated in the request, all material shall be new, newest model year, and free from defects. Items which are used, demonstrators, obsolete, seconds, or which have been discontinued are unacceptable without prior written approval by the City.

5.0 QUANTITIES: The quantities shown on this request are based on estimated needs. The City reserves the right to increase or decrease quantities to meet actual needs.

6.0 DELIVERY: Deliveries shall be F.O.B. destination freight prepaid and included unless otherwise specified.

7.0 PRICING AND DISCOUNT: The City qualifies for governmental discounts. Unit prices shall reflect these discounts.

7.1 Unit prices shown on the bid/proposal or contract shall be the price per unit of sale (e.g., gal., cs., doz., ea.) as stated on the request or contract. For any given item, the quantity multiplied by the unit price shall establish the extended price; the unit price shall govern in the bid/proposal evaluation.

7.2 Prices established in continuing agreements and term contracts may be lowered due to general market conditions.

8.0 RESPONSES TO REMAIN OPEN: Responses must remain open and will be deemed to be open and subject to acceptance until awarding of the bid/proposal is finalized, or a minimum of sixty (60) days unless otherwise specified.

9.0 ACCEPTANCE-REJECTION: The City reserves the right to accept or reject any or all bids/proposals, to waive any technicality in any bid/proposal submitted, request clarification of any bid/proposal, award a bid/proposal that is not the lowest price, and to accept any part of a bid/proposal as deemed to be in the best interests of the City.

10.0 GUARANTEED DELIVERY: Failure of the Contractor to adhere to delivery schedules as specified or to promptly replace rejected materials shall render the Contractor liable for all costs in excess of the contract price when alternate procurement is necessary. Excess costs shall include the administrative costs and other costs attributable to the delay.

11.0 CONTRACT AND EXECUTION OF CONTRACT: Unless otherwise specified in the bid/proposal, the successful responder agrees to enter into a contract, a copy of which will be on file in the office of the City of Sheboygan Purchasing Department. Contractor shall and will well and truly execute and perform this contract under the terms applicable to the satisfaction of the City, and shall promptly make payment to each and every person or party entitled thereto of all the claims for work or labor performed and materials furnished in the performance of this contract.

12.0 ENTIRE AGREEMENT: These Standard Terms and Conditions shall apply to any contract or order awarded as a result of this request except where special requirements are stated elsewhere in the request; in such cases, the special requirements shall apply. Further, the written contract and/or order with referenced parts and attachments shall constitute the entire agreement and no other terms and conditions in any document, acceptance, or acknowledgment shall be effective or binding unless expressly agreed to in writing by the City.

13.0 APPLICABLE LAW AND COMPLIANCE: This contract shall be governed under the laws of the State of Wisconsin. The Contractor shall at all times comply with and observe all federal and state laws, local laws, ordinances, and regulations which are in effect during the period of this contract and which in any manner affect the work or its conduct. The City reserves the right to cancel this contract if the contractor fails to follow the requirements of s. 77.66, Wis. Stats., and related statutes regarding certification for collection of sales and use tax. The City also reserves the right to cancel this contract with any state or federally debarred contractor or a contractor that is presently identified on the list of parties excluded from federal procurement and non-procurement contracts.

14.0 LICENSES AND PERMITS: Contractor shall have and/or provide any and all licenses and permits required to perform the work specified and furnish proof of such licensing authorization and permits with their bids if required.

15.0 ASSIGNMENT: No right or duty in whole or in part of the Contractor under this contract may be assigned or delegated without the prior written consent of the City.

16.0 NONEXCLUSIVE CONTRACT: Unless otherwise stated, the City reserves the right to purchase work or materials outside of this contract.

17.0 NONDISCRIMINATION & AFFIRMATIVE ACTION: In connection with the performance of work under this contract, the Contractor agrees not to discriminate against any employee or applicant for employment because of age, race, religion, color, handicap, sex, physical condition, developmental disability as defined in s. 51.01(5), Wis. Stats., sexual orientation as defined in s. 111.32(13m), Wis. Stats., or national origin. This provision shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Except with respect to sexual orientation, the contractor further agrees to take affirmative action to ensure equal employment opportunities.

18.0 INDEPENDENT CAPACITY: The parties hereto agree that the contractor, its officers, agents, and employees, in the performance of this agreement shall act in the capacity of an independent contractor and not as an officer, employee, or agent of the City. The contractor agrees to take such steps as may be necessary to ensure that each subcontractor of the contractor will be deemed to be an independent contractor and will not be considered or permitted to be an agent, servant, joint venture, or partner of the City.

19.0 SAFETY REQUIREMENTS: All materials, equipment, and supplies provided to the City must comply fully with all safety requirements as set forth by the Wisconsin Administrative Code and all applicable OSHA Standards.

20.0 WARRANTY: Unless otherwise specifically stated, equipment purchased as a result of this request shall be warranted against defects by the Contractor for one (1) year from date of receipt. The equipment manufacturer's standard warranty shall apply as a minimum and must be honored by the Contractor.

21.0 INSURANCE RESPONSIBILITY: If insurance is required, satisfactory proof of the existence and carriage of such insurance of the kinds and limits specified will be required.

22.0 CANCELLATION: The City reserves the right to cancel any contract in whole or in part without penalty due to non- appropriation of funds or for failure of the contractor to comply with terms, conditions, and specifications of this contract.

23.0 OPEN RECORDS: Both parties understand that the City is bound by the Wisconsin Public Records Law, and as such, responses and contracts are subject to and conditioned on the provisions of the law. Contractor acknowledges that it is obligated to assist the City in retaining and producing records that are subject to Wisconsin Public Records Law, and that the failure to do so shall constitute a material breach of the contract, and that the Contractor must defend and hold the City harmless from liability under that law. Except as otherwise authorized, those records shall be maintained for a period of seven (7) years after receipt of final payment under the contract.

24.0 MATERIAL SAFETY DATA SHEET: If any item(s) on an order(s) resulting from this award(s) is a hazardous chemical, as defined under 29CFR 1910.1200, the Contractor shall provide one (1) copy of a Material Safety Data Sheet for each item with the shipped container(s) and one (1) copy with the invoice(s).

25.0 ADVERTISING AND NEWS RELEASES: Reference to or use of the City, any of its departments, officials, or employees, for commercial promotion is prohibited. News releases pertaining to this procurement shall not be made without prior approval of the City. Release of broadcast e-mails pertaining to this procurement shall not be made without prior written authorization of the City.

26.0 HOLD HARMLESS: The Contractor will indemnify, pay the cost of defense including attorney's fees, and save harmless the City and all of its officers, agents and employees from all suits, actions, or claims of any character brought for or on account of any injuries or damages received by any persons or property resulting from the operations of the contractor, or of any of its contractors, in prosecuting work under this agreement.

27.0 FOREIGN CORPORATION: A foreign corporation (any corporation other than a Wisconsin corporation) which becomes a party to this contract is required to conform to all the requirements of Chapter 180, Wis. Stats., relating to a foreign corporation and must possess a certificate of authority from the Wisconsin Department of Financial Institutions, unless the corporation is transacting business in interstate commerce or is otherwise exempt from the requirement of obtaining a certificate of authority. Any foreign corporation which desires to apply for a certificate of authority should contact the Department of Financial Institutions, Division of Corporation, P. O. Box 7846, Madison, WI 53707-7846; telephone (608) 261- 7577.

28.0 FORCE MAJEURE: Neither party shall be in default by reason of any failure in performance of this contract in accordance with reasonable control and without fault or negligence on their part. Such causes may include, but are not restricted to, acts of nature or the public enemy, acts of the government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and unusually severe weather, but in every case the failure to perform such must be beyond the reasonable control and without the fault or negligence of the party.

BIDDER'S PROOF OF RESPONSIBILITY

This proof of Responsibility is required
pursuant to Section 66.0901 of the Wisconsin Statutes.

**(Must be filed with the Engineering Division
not less than five (5) days prior
to the time set for opening of bids.)**

This form should be submitted to:

City of Sheboygan
Engineering Department
Municipal Service Building
2026 New Jersey Avenue
Sheboygan WI 53081

NOTE: The contents of this questionnaire shall be confidential for the exclusive use of the contracting agency and shall not be made public except by written permission of the prospective bidder.

BIDDER'S PROOF OF RESPONSIBILITY

The contents of this questionnaire will be considered confidential.

If the Engineering Division is not satisfied with the sufficiency of the answers to the questionnaire and financial statement, it may reject the bid or disregard the same or require additional information.

The City reserves the right to require separate Statements for bidding on each public contract. In no event shall this Statement of Bidder's Qualifications be used to qualify bidders for public contracts after one (1) year from this Statement's date.

STATEMENT OF BIDDER'S QUALIFICATIONS

1. Name of Bidder _____
   ___ Corporation _____ Partnership _____ Individual

2. Bidder's Address _____

   City _____ State/Zip _____

   Phone No. _____ FAX No. _____

   E-Mail Address _____

3. When organized? _____ Where incorporated? _____

4. How many years have you been engaged in the contracting business under the present firm name? _____

5. Contracts on hand (Show present contracts, including a schedule as to estimated completion date and gross amount of each contract.

Date Awarded	Type of Work	Percent Completed	Anticipated Completion Date	Cost of Work

(If additional space is required, file separate sheet with details.)

6. General character of work performed by your firm.

(If additional space is required, file separate sheet with details.)

7. Have you ever failed to complete any work awarded to you?
_____ Yes _____ No

If so, attach a statement explaining where and why.

8. Have you ever defaulted on a contract? _____ Yes _____ No

If so, explain where and why.

(If additional space is required, file separate sheet with details.)

9. List your major equipment.

(If additional space is required, file separate sheet with details.)

10. List your experience in the construction of work similar in importance to this project.

(If additional space is required, file separate sheet with details.)

11. Show background and experience of the principal members of your personnel including the officers.

Name	Position Held or Office Held	Years of Construction Experience	Magnitude and Type of Work	Capacity

(If additional space is required, file separate sheet with details.)

12. Credit available. Furnish written evidence, preferably from banks.

13. Financial Statement:

Condition at Close of Business on _____ , _____.

Assets:

a. Cash _____

b. Accounts Receivable _____

c. Real Estate Equity _____

d. Materials in Stock _____

e. Equipment, Book Value _____

f. Furniture & Fixtures
Book Value _____

g. Other Assets _____

TOTAL ASSETS $_____

Liabilities:

h. Accounts, Notes &
Interest Payable _____

i. Other Liabilities _____

TOTAL LIABILITIES $_____

NET WORTH **$**_____

14. Additional information may be submitted if desired.

Dated at _____ this _____ day of _____, _____ .

NAME OF ORGANIZATION

BY _____

TITLE _____

State of _____

County of _____

_____ being duly sworn says that he is

_____ of _____
(Organization)

and that the answers of the foregoing questions and all statements contained are true and correct.

Signed _____

Subscribed and sworn to before me this _____ day of _____, _____ .

_____ Notary Public

My commission expires _____

CHAPTER IX – PUBLIC WORKS AND PROJECTS

Explanation

There are presented below those portions of Chapter 66, 03-04 Wisconsin Statutes, relating to the pre-qualification of bidders.

"66.0901 (2) *BIDDERS PROOF OF RESPONSIBILITY.* A municipality intending to enter into a public contract may, before delivering any form for bid proposals, plans, and specifications to any person, except materialmen, suppliers, and others not intending to submit a direct bid, require the person to submit a full and complete statement sworn to before an officer authorized by law to administer oaths. The statement shall consist of information relating to financial ability, equipment, experience in the work prescribed in the public contract, and other matters that the municipality requires for the protection and welfare of the public in the performance of a public contract. The statement shall be in writing on a standard form of a questionnaire that is adopted and furnished by the municipality. The statement shall be filed in the manner and place designated by the municipality. The statement shall not be received less than 5 days prior to the time set for the opening of bids. The contents of the statement shall be confidential and may not be disclosed except upon the written order of the person furnishing the statement, for necessary use by the public body in qualifying the person, or in cases of actions against, or by, the person or municipality. The governing body of the municipality or the committee, board, or employee charged with, or delegated by the governing body with, the duty of receiving bids and awarding contracts shall properly evaluate the statement and shall find the maker of the statement either qualified or unqualified. This subsection does not apply to a 1st class city.

(3) *PROOF OF RESPONSIBILITY, CONDITION PRECEDENT.* No bid shall be received from any person who has not submitted the sworn statement as provided in sub. (2), provided that any prospective bidder who has once qualified to the satisfaction of the municipality, committee, board or employee, and who wishes to become a bidder upon subsequent public contracts under the same jurisdiction, need not separately qualify on each public contract unless required to do so by the said municipality, committee, board or employee."

Updated: October 30, 2007

ATTACHMENT 2 Non-Collusion Certification

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in case of a joint bidder, each party certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and behalf:

1) The prices in this bid have been arrived at independently without collusion, consultation, Communication or agreement, for the purpose of restricting competition as to any other matter relating to such prices with any other bidder, or with any other competitor.

2) Unless otherwise required by law, the prices quoted in this bid have not been knowingly disclosed by the bidder, and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or competitor; and,

3) No attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not submit a bid for the purpose of restricting competition.

Date: _____

Company Name _____

Signature _____

Title _____

SECTION 26 05 00 – ELECTRICAL CONTRACT REQUIREMENTS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work under this Section.

1.2 APPLICABLE PUBLICATIONS

A. Publications, standards and listing requirements called out in the Sections of this Division of Labor shall form a part of these specifications as if contained herein.

B. The requirements of the Contract Documents, including the General Conditions, and Supplementary Conditions, and Division 01 - General Requirements, apply to this section except as modified herein.

1.3 DESCRIPTION OF WORK

A. Sections included:

1. Section 26 05 00 - ELECTRICAL CONTRACT REQUIREMENTS
2. Section 26 05 01 - PROJECT SPECIAL CONDITIONS
3. Section 26 05 02 - DEMOLITION
4. Section 26 05 04 - DOCUMENTATION
5. Section 26 05 05 - THROUGH PENETRATION FIRESTOPPING
6. Section 26 05 19 - WIRE AND CABLE
7. Section 26 05 26 - GROUNDING
8. Section 26 05 29 - SUPPORTING DEVICES
9. Section 26 05 34 - RACEWAYS
10. Section 26 05 35 - ELECTRICAL BOXES
11. Section 26 05 37 - LOCATION OF OUTLETS AND EQUIPMENT
12. Section 26 05 53 - ELECTRICAL IDENTIFICATION
13. Section 26 05 73 - ELECTRICAL SYSTEMS ANALYSIS
14. Section 26 09 23 - LIGHTING CONTROLS
15. Section 26 24 16 - PANELBOARDS
16. Section 26 27 26 - WIRING DEVICES
17. Section 26 27 28 - CIRCUIT AND MOTOR DISCONNECTS
18. Section 26 32 00 - STANDBY ENGINE/GENERATOR SET
19. Section 26 36 00 - GENERATOR TRANSFER SWITCH

B. Work Included:

1. The work covered by this Division of the specifications includes the furnishing of all labor, materials, tools, equipment, permits, certificates and temporary protection necessary for or incidental to executing and completing the electrical work, communications work, and work on related systems.
2. All work shall be as specified and indicated on the drawings unless specifically excepted on the drawings or herein.
3. Read all other Divisions of the Specifications which are applicable to this work, including the General Conditions section applicable to all bidders.
4. The Electrical Contract Requirements section is a supplement to and not a replacement for the project General Conditions section.
5. In cases of conflict with information in the General Conditions, the more stringent of the contract requirements shall be considered applicable.
6. Prior to submitting bid, call to the attention of the Electrical Engineer any material or apparatus believed to be inadequate or any necessary items or work omitted.
7. Address any questions regarding the interpretation of the plans and/or specifications at least 12 days before the bid opening.

8. The Electrical Engineer reserves the right to interpret his own specifications and plans after bids are received, and to demand that the installation conform to his intent.
9. Failure to become acquainted with existing conditions at the site shall in no way relieve the responsibility for making installation in conformance with plans and specifications without additional cost to the owner.

C. Examination of Plans, Specifications and Site:

1. Before submitting a bid, the bidder shall familiarize himself with all features of the building and site which may affect the execution of his work.
2. No extra payment will be allowed for the failure to obtain this information.
3. If there are omissions or errors in the plans or specifications, they shall be clarified with the Engineer prior to submitting bid.
4. For all remodeling projects, a site visit to the premises, for the purpose of the noting of all existing conditions which may affect work is required.
5. Knowledge of all existing conditions, which may affect work in a renovation project, shall be included in the preparation of bid.
6. Lack of information on existing conditions shall not be allowed for a valid cause for additional compensation.

D. Codes, Permits, and Inspection Fees

1. All work and materials shall conform in every respect to the current rules and requirements of the National Fire Protection Association, National and State Electrical Codes, Local Codes and Ordinances, Local Utility Regulations and OSHA.
2. Give to the proper authorities all required notices relating to the project, obtain all official permits and licenses required, pay all fees incidental thereto, deliver upon completion of the work and without cost to the Owner all required certificates of inspection and approval.

1.4 RELATED WORK ELSEWHERE

A. Applicable provisions of Division 01: General Conditions shall govern work in this section.
B. All other Divisions of the Specifications which are applicable to or interface with work in Division 26 05 00.
C. Division 26 : Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.
B. Submit shop drawings following Section specific Shop drawing submittal guidelines.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit operation and maintenance manuals in accordance with Section 26 05 04.
B. Submit operation and maintenance manuals following Section specific shop drawing submittal guidelines.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. All materials, equipment and parts are to be new, undamaged and unused of current manufacture.
C. Acknowledges acquaintance with the plans and specifications and their respective requirements.
D. Guarantee that the electrical system has been installed strictly in accordance with the electrical plans and specifications using only the best of materials available, installed in a substantial manner by experienced labor.
E. Various components of the electrical system shall be placed in service prior to completion date as instructed by Owner. This shall not change the guarantee period which shall be one year after acceptance by Owner.
F. Replace and/or repair any items failing from causes of faulty workmanship, materials or design without cost to Owner at any time within one year from date of final acceptance.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

PART 2 - PRODUCTS

2.1 GENERAL

A. It is the intent of these specifications that all the necessary material, apparatus, and devices to complete the installation as specified herein, except such parts as are specifically excepted, shall be provided.

B. If an item is either shown on the plan or called for in these specifications, it shall be considered sufficient of said item in this contract.

C. All sizes given are as minimum.

D. Material and labor shall be first class and workmanlike and to the satisfaction of the Electrical Engineer and shall be subject to inspection test and approval at all times from commencement until acceptance of completed work.

E. Manufacturers shall be responsible for providing material listed by U.L. or other approved agencies, and all governing codes and ordinances.

F. All material must bear U.L. and/or other approved labels where possible.

G. Items specified by catalog number or brand name and approval of shop drawings will not relieve the manufacturer of this responsibility.

2.2 MATERIALS: ALTERNATE MATERIALS

A. Where materials, equipment apparatus, or other products are specified by manufacturer, brand name, and type of catalog number such designation is to establish standards of desired quality and style and shall be the basis of the bid.

B. Substitutions shall not be made unless there are "equals" listed in the specifications or on the plan.

C. Substitutions may be bid as alternates.

D. Burden of proof that materials are equal shall be upon bidder requesting their use; therefore, bidder shall furnish, with their request for approval all supporting data.

E. Assume responsibility for substituted material and state name of manufacturer, type or brand or equipment and addition to or deduction from base bid.

F. Materials and equipment must meet all requirements as to type, quality, function, appearance and physical dimensions shown.

G. Assume responsibility for any costs to other Divisions as a result of the use of alternate materials.

H. Submit supporting data to Engineer/Electrical Engineer within 15 days after the bid date.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Equipment Submittal Drawings

1. Within 45 days after a notice to proceed and prior to ordering equipment, furnish to the Electrical Engineer submittal drawings for review (see section 26 05 04).
2. Review of any submittal drawings does not waive any condition of the specifications unless specifically noted thereon.
3. No fabrication or ordering of equipment shall be started until reviewed drawings are returned.

3.2 FIELD MEASUREMENTS

A. Job Drawings

1. Maintain, at the job site, one (1) complete set of up-to-date plans and written specifications, complete with all addenda items.

2. This complete plan and specification set shall be reserved for all field markings to show minor revisions and detailed construction notes.
3. These marked plans shall be returned to the Electrical Engineer prior to contract completion and final payment.
4. Assist the Electrical Engineer in transferring applicable field notes to the project drawings for record purposes.

3.3 DELIVERY, STORAGE AND HANDLING

A. Material On Site and Storage

1. Maintain proper care and storage of material and equipment on site.
2. Any material damaged by rust corrosion, warping, breakage, finish damage, etc. shall be replaced by the Contractor to the satisfaction of the Engineer.

3.4 INSTALLATION

A. Field Change Orders

1. No revisions to the contract price shall be allowed unless such revisions have been authorized in writing by both Owner and the change order submitter.
2. All work completed prior to completion of a written contract change order will not be compensated for by the Owner.
3. Any work item that is proposed to perform, on the basis of a proposed contract adder, must be announced in advance such that time is available for the Engineer, Owner and the Electrical Engineer to determine if a change in contract price is allowable.

B. Change Orders

1. Change orders may be requested as a part of this project.
2. Assume the following in regards to change orders:
    a. Work and equipment associated with change orders shall be installed per the specified equipment on this project.
    b. All change orders shall be accounted for on as-built drawings.
    c. Change order additions to special systems where riser diagrams have been furnished, shall be included as a part of the riser diagram.
    d. A break down of all costs associated with the change order is required.
    e. The cost breakdown shall be as follows:
        1) Itemized list of all materials.
        2) Materials shall be priced at Best Column in a national pricing service book.
        3) Cost for subcontractor services.
        4) Subcontractor services shall be shown as actual costs from subcontractor.
        5) Material mark-up.
        6) Maximum allowed is 8%.
        7) Number of hours of labor at standard charge out rate.
        8) Total change order cost.
3. If equipment or materials are deducted as a part of this change order, credit shall also be shown on change order.

C. Installation: General

1. Connections to Equipment Furnished By Others.
    a. Included in Division 26 are electrical connections to equipment provided by others.
    b. Refer to final shop drawings for equipment provided by other divisions for exact location of electrical outlets and the connections required.

c. Provide energization to the equipment furnished by other Divisions only at the request of the providing party.
d. Assume that once the equipment has been started up, that it shall be shut off unless it is requested that it be left on by the providing party.
e. Only start up and turn on equipment if requested so by the party providing said equipment.
f. If required, power shall not be activated to the equipment until qualified starting personnel are on site.
g. After making a permanent power connection, the breaker shall be left in an off position and a "hold" tag or some other device be utilized to keep the power turned off to the equipment.

2. Relocating of equipment.

a. Assume responsibility for relocating of all electrical equipment as shown on the drawings.
b. As a part of this relocation, be responsible to:

1) Determine the extent of the electrical work for the existing installation.
2) Disconnect existing electrical equipment and remove all unused equipment from existing area.
3) Install new conduit from existing controls to new equipment.

c. Extend all wiring:

1) Assume responsibility for installing new wire from control panel point to equipment.
2) Do not splice cables.

d. Visit the site prior to bid and bring any specific relocation of equipment questions to the attention of the Owner and Electrical Engineer prior to bidding.

3. Assume responsibility for all requirements pertaining to this relocation.
4. Equipment Access & Location.

a. All equipment, junction and pull boxes, and accessories shall be installed to permit access to equipment for maintenance.
b. Any relocation of conduits, equipment, or accessories required to provide maintenance access shall be accomplished at no additional cost.
c. Equipment shall be installed with ample space allowed for removal, repair or changes to the equipment.
d. Ready accessibility to equipment and wiring shall be provided without moving other equipment which is to be installed or which is already in place.
e. Locate electrical outlets and equipment to fit the details, panels, decorating or finish at the space.
f. The Engineer shall reserve the right to make minor position changes up to 10' of the outlets before the work has been installed.
g. Verify door swings before installing room lighting switch boxes, and install boxes on the latch side of door unless noted otherwise.
h. Furnish information as to exact location and size of sleeves for openings for new construction.
i. Provide and set in place all required sleeves, inserts, forms, etc. and coordinate this work with all other divisions of work.

5. Cutting and patching.

a. Beams or columns shall not be pierced without permission of the Engineer and then only as directed.
b. If any openings are required through walls or floors where no sleeve has been provided, the hole for the sleeve shall be core drilled to avoid all unnecessary damage and structural weakening.

c. Provide all cutting and patching required for complete installation of systems unless specifically noted elsewhere.
d. All new or existing work cut or damaged shall be patched and restored to its original condition.
e. Coordinate the location of sleeves, openings, chases, furred spaces, etc.
f. Provide during the progress of construction all sleeves, hangers and inserts that are to be built into the structure.
g. Provide sleeves for cables passing through masonry, concrete or other similar construction.
h. Sleeves shall be of metal conduit and shall extend completely through the construction.
i. Conduits or cables penetrating smoke or fire barriers must not destroy the barrier's integrity.
j. Grout openings between sleeves and concrete or masonry walls and floors.
k. Pack annular space between sleeves and conduits with fiberglass.
l. Where penetrations occur through fire rated walls or floors, fill space with fire resistive caulk.
m. Wherever cables must pass through fire or smoke rated walls or floors, provide approved, sleeved, foam filled fire stops around cables as manufactured by O.Z., Dow, Square D, or equal.
n. Provide all materials required for patching unless otherwise noted.
o. Where alterations disturb lawns, paving, walks, etc., the surfaces shall be repaired, refinished and left in the condition existing prior to commencement of work.

6. Excavation and backfill.

a. Backfilling of all trenches beneath concrete floor and stair slabs within building shall be accomplished with gravel fill and shall be specially compacted to same density as surrounding area.
b. Lines passing under foundation walls shall have a minimum of 1 1/2 inch clearance.
c. Care shall be taken to insure no disturbance of bearing soil under foundations.

7. Attachments and supports.

a. Be responsible for proper fittings and support for each item of equipment and materials installed under Division 26.
b. Be responsible for the proper application, installation and location of all necessary and required inserts, supports and anchor bolts.
c. Where same are to be installed by other Divisions of work, supply same to the contractor in whose work they occur with instructions for placement and proper installation.
d. Establish the method and nature and select accessories necessary for proper support appropriate to item and point of attachment with due consideration given to ambient/environmental conditions and service duty.
e. Attachments, supporting devices and accessories shall be specifically designed for the application, suitable for the duty imposed in service and acceptable to the Engineer.
f. Attachments shall be made to structural components of the structure in such manner not to jeopardize the integrity of the structure and otherwise consistent with trade practices.
g. Generally, anchors shall be concrete insert type in poured concrete and drilled expansion type in precast concrete.
h. Powder actuated anchors shall not be used in concrete work.
i. Provide all mounting backboards as required to mount electrical and electronic equipment.
j. That equipment which is normally assumed to be mounted on some type of a backboard shall be mounted on backboards provided by Division 26.

k. All mounting backboards used by the contractor shall be 3/4" AC grade marine duty plywood.
l. All plywood shall be painted on both sides and edges with two coats of fire resistant white enamel paint.
m. Provide back mounting panels to meet this specification.
n. Steel channel interior to be painted or galvanized.
o. Exterior conduit mounting channel shall be stainless steel.
p. All sleeves to be furnished and installed by Division 26.

D. Installation: Temporary Electric Distribution

1. Be responsible for all costs associated with installing the electrical service and removing the electrical service and temporary power distribution after permanent power has been installed in the facility.
2. All power consumption costs for the temporary service will be paid by the Owner.
3. Temporary power requirements other than the specified, shall be furnished by the Division of work requiring the same.
4. Install temporary electric distribution per general requirements, section GR-1.
5. Installation of the temporary power and lighting system is to begin upon notification by the Engineer and shall be installed and routed in manner acceptable to the Engineer and the various trades so as not to interfere with construction of the project.
6. The temporary power and lighting system should be adequate for the construction of this project and in accord with OSHA Requirements for Construction Projects.
7. Provide a minimum of 20 foot candles of lighting in work areas for construction.
8. The temporary light and power system shall include fused main disconnect switch, panelboards, branch circuits, outlets, lamps and the maintenance thereof.
9. Temporary lights shall be equipped with heavy duty electric cords and guards.
10. Temporary lights must not be suspended by the power supply cord unless it is designed for this use.
11. Furnish 2 general purpose, 20 ampere, 120 volt, single phase, grounding type receptacle outlets for every 1000 square feet of floor space.
12. The maximum length of a 20 ampere, 120 volt lighting or power circuit shall not be greater than 200' from panelboard to farthest outlet.
13. All single phase receptacle outlet circuits shall have approved ground fault circuit interrupter protection or other OSHA approved protection systems.
14. Electric Utility Temporary Service fees shall be included in bid.
15. Temporary power requirements, other than the specified, shall be furnished by the division of work requiring the same.

E. Installation: Trial Usage Of Electrical Systems

1. The Electrical Engineer has the privilege of the trial usage of electrical systems or parts thereof for the purpose of testing under load the new installation and learning the operational procedures.
2. The trial usage shall be continued for a length of time as deemed reasonable by the Electrical Engineer and all related costs shall be included in the bid, with the exception of the electrical power cost which will be paid by the Owner.
3. The operations shall be carried out only with the express knowledge and under supervision of the responsible sub-trade who shall not waive any responsibility because of trial usage.
4. While trial usage will be kept to a minimum, it shall not be construed as acceptance by the Electrical Engineer.

F. Installation: Cooperation/Coordination

1. Coordinate and cooperate with other Divisions of work and Owner by scheduling and installing work to facilitate the construction progresses and the Owners use of the building.
2. Any deviation from contract plans shall be approved by the Electrical Engineer before proceeding.

3. Study the plans of other trade divisions of work and to fit work into the work of others in a coordinated manner.
4. Lay out work and be responsible for measurements.
5. Check facilities provided by others which require electrical connections and provide outlets suitably located for them.
6. Take such measurements as may be necessary to assure approved fitting and proper installation of his work and all other work depending thereon.
7. Cooperate with other contractors to avoid complications between the installation of electrical equipment and equipment installed by others.

G. Installation: Finish And Painting

1. Equipment and materials such as transformers, panels and switches, shall be furnished with the manufacturer's standard finishes, consisting of a prime coat and baked enamel finish coat, unless otherwise noted.
2. Roof mounted equipment and other exterior materials including support hardware shall have a factory or field applied prime coat and finish coat of color selected by the Owner's Representative.
3. In general painting will be done by other trades. Assume responsibility to coordinate work with the painters so that all equipment is installed prior to painting.
4. Assume responsibility for additional expense required to paint support channels, panel trims, flush junction box covers, fixture hangers and other electrical devices not in place prior to normal routine painting.
5. An undamaged finish is required on all equipment.
6. If finish becomes rusted, corroded, scratched, or flaked during storage or installation, be responsible for refinishing the equipment to the satisfaction of the Engineer.
7. Finish painting on the job site is not required by the electrical contractor, except where noted.
8. Refer to other areas of this Division 26 for painting of equipment furnished by the Division 26.
9. Where painting is required to be done by the electrical contractor, the painting shall be done in accordance with the painting portion of the general specification.

H. Installation: Damage To Other Work

1. Assume responsibility for all damages resulting from the execution of work under Section 26 05 00.
2. Assume responsibility to adequately protect Division 26 work at all times.
3. All damages resulting from their operations shall be repaired, or the damaged portions replaced by the party originally performing the work (to the entire satisfaction of the Engineer), and all cost thereof shall be borne by those responsible for the damage.

I. Installation: Clean-Up

1. At all times, keep the premises free from excessive accumulation of waste materials or rubbish resulting from work, including tools, scaffolding, and surplus materials and leave work room or it's equivalent, clean.
2. In case of dispute, the Engineer may order the removal of such rubbish and charge the cost to the responsible Division of work as determined by the Engineer.
3. At the time of final clean-up, all fixtures and equipment shall be thoroughly cleaned and left in proper conditions for their intended use.

J. Installation: Drawing Schedules And Details

1. The electrical drawings include a number of standard and job specific details.
2. These details may or may not be specifically referenced on the drawings and in the specification.
3. Assume that even if the detail is not specifically referenced, that it shall apply to this project. (As an example, if a detail is shown for the exterior mounted receptacles, but the detail is not referenced from the plan sheets, the contractor shall assume that all exterior mounted receptacles shall be installed per the detail.)

4. Details and schedules are shown as a means to aid the electrical contractor and are not meant to be all inclusive of all devices.
5. Assume responsibility for making takeoff of equipment required, (i.e., additional circuit breakers, motor connections, etc.) and ancillary equipment and appurtenances for a complete connection or circuit.
6. Verify all sizes of electrical equipment with shop drawings and nameplate rating of the equipment it serves.

K. Installation: Bid Drawings

1. It must be understood that electrical drawings and details bid drawings are diagrammatic.
2. Electrical drawings and details bid drawings are not intended to be shop drawings.
3. It is expected that it may be necessary to move conduit, outlets and/or equipment in some cases to get coordinated installation and such changes are considered a part of the Contract obligation without cost to the Owner.
4. No outlets or equipment shall be located where the usefulness and/or operation will be affected by the work of other trades, door swing, counter, equipment, etc.

L. Installation: Contract Termination Requirements

1. Furnish Owner with service manuals for all items furnished under this Contract.
2. Service manuals shall be complete with drawings, diagrams, operations and installation instructions and parts lists.

3.5 OWNER TRAINING

A. Provide as outlined in each specification section requiring owner training.

3.6 SPARE EQUIPMENT

A. Provide as outlined per section 26 05 04.

END OF SECTION 26 05 00

SECTION 26 05 01 – PROJECT SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. This specification covers those conditions that are particular to the Sheboygan MSB Generator and Service Replacement project. This section further explains and outlines other portions of these specifications.

PART 2 - PRODUCTS

2.1 CT/DISCONNECT CABINET

A. For pricing contact:

1. American Midwest Power
2. 3131 Vicksburg Ln N, Minneapolis, MN 55447
3. Attn: Jordan Garvin
4. Area Manager
5. Office: 763-852-3660
6. Cell: 952-334-5388
7. Email: JGarvin@ampmfg.com

2.2 UTILITIES

A. Electrical Utilities

1. Alliant Energy
   Attn: Ben Reisen
   4421 Tower DR Sheboygan WI 53081
   Phone: 1-920-459-6367
   Cell: 1-920-2103751
   Email: BenReisen@alliantenergy.com
   Electric Service Utility costs shall be included in Electrical Contractor bid (see allowances).

2. Temporary Electric Service
   a. Installed by Electrical Contractor

3. Temporary Electrical Service Utility Fee
   a. By Electrical Contractor

4. Utility Costs
   a. See allowances

5. Temporary Power Usage Cost
   a. By Owner

2.3 CONCRETE PADS

A. Provided per Division 26 unless otherwise specifically stated on the plans.

2.4 EQUIPMENT FURNISHED BY OWNER FOR DIVISION 26 INSTALLATION

A. Be responsible for installation of all equipment that is being furnished directly by the Owner. Include costs in bid to move the equipment from the owners storage to the project site, unpack the equipment, inspect the equipment for damage and call to the Owners attention any problems, dispose of packaging materials, and provide all connection and adjustment.

2.5 J&H CONTROLS

A. The lighting in the Vehicle Storage Bays are controlled through the BAS (Building Automation System). This is system was installed by J&H Controls. If necessary contact:

1. J&H Controls Inc.
Attn: Mark Hawley, Owner – CEO
490 N. Rolling Meadows Dr
North Fond du Lac, WI 54937
Main Office Phone: 920-921-3144
Cell: 920 979 7172
Email: mhawley@jhcontrols.com

2.6 FIRE ALARM SYSTEM

A. Monitoring for the generator shall be connected to the existing fire alarm system as shown on the drawings. All wiring shall be in conduit, see drawings for more information. The fire alarm drawings will not have to be send to the State for review.

1. JSM Secure Inc
Attn: Jeff Shon
N5764 CTH TT, P.O. Box 118 Sheboygan Falls, WI 53085
Office Phone: 800-876-1987
Direct Line: 920-467-2281
Cell: 920-627-1902
Fax: 920-467-8686
Email: jeff.Sohn@jsmcom.com.

2.7 NATURAL GAS CONNECTION FOR GENERATOR

A. The electrical contractor shall provide a mechanical contractor to install the natural gas line for the generator as shown on the drawings.

2.8 EMERGENCY FIXTURES

A. All fixture currently located in the Vehicle Garage are wired with cord and plug. For the lights that are being connected to the emergency system (NEC 700) the EC shall remove the cord and plug and directly wire the fixture the to junction box.

2.9 MULTI-POLE CIRCUITS

A. Multi-pole circuits are not allowed for single-phase line to neutral loads. Provide breaker ties for all new breakers where share neutrals maybe used.

2.10 COORDINATION STUDY

A. The electrical contractor shall be responsible for providing a breaker coordination study for the entire distribution system. This work shall be submitted to the local inspector and the engineer. Breakers in generator must be same manufacturer as panelboards. See Specification Section 26 05 73. Provide coordination study prior to ordering the distribution equipment so changes are allowed if necessary.

PART 3 - EXECUTION

3.1 ALLOWANCES

A. Electrical Utility: $10,000

3.2 ALTERNATES (NONE)

END OF SECTION 26 05 01

SECTION 26 05 02 - ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

2.2 CONNECTING TO AND REUSING EXISTING BREAKERS

A. Whenever new loads are connected into existing panelboards, assume you cannot connect to the existing circuit breakers that are in the panel in use. Replace said circuit breakers with new circuit breakers. The exception to this is that the contractor can have the circuit breaker tested and furnish a test report indicating that it was tested and is operating properly.

2.3 ROUTING CONDUITS TO EXISTING FLUSH MOUNTED PANELS

A. Existing flush mounted panels are being reused to feed new equipment. Assume responsibility for installing new conduits into the panel. However, if existing conduits have adequate space, they may be reused for the additional circuits.

B. For new conduits into panel, assume responsibility for cutting and patching wall to install conduits. Wall surface shall be patched back to its original finish, material, and color.

2.4 PANELBOARD REPLACEMENT

A. Specific required work for flush mounted panelboard replaced in place:

1. Remove all existing panelboard interior and panel tub as required.
2. Install new panelboard in place.
3. Provide new overlapping trim that overlaps entire existing opening. If required, trim shall be manufactured specifically to cover opening.
4. Reconnect all existing reused circuits and any new circuits.
5. Fill in any empty wall recesses with same material of same finish as existing wall.
6. Splice or reefed any circuits that require additional circuit extensions to connect to new circuit breakers.
7. Install new raceways in wall as necessary to provide new circuits. If wall must be cut, include cutting and patching back to original finish.
8. Replace existing feeder, if necessary, to have the correct feeder length to reach connection point.
9. Provide new tub if necessary.

B. Specific required work for surface mounted panel replacement with new:

1. Assume that any adjacent wall mounted devices that are to be relocated to allow the new panel to be installed are to be relocated and included as part of the electrical work.
2. Reconnect any existing wall mounted devices that are adjacent to panel and are connected in the panel.
3. Provide new tub, if required, and make necessary modifications to raceways entering tub.
4. Reconnect all existing reused circuits and any new circuits.
5. Provide necessary extensions to feeder and branch circuits such that they connect to the new panelboard.
6. Replace existing feeder, if necessary, to have the correct feeder length to reach connection point.

C. Replacement of existing panel in new location:

1. Remove existing panel in its entirety. Assume that existing channel tub cannot be used as a splice point.
2. Pull back all circuits to above ceiling or below floor. Extend to new location.
3. For circuits that enter through floor, assume that all circuits will have to be intercepted at the last connection point (light fixture receptacle, light switch, or other device) and extend a new branch circuit from that location to the panelboard.
4. Provide all necessary splices to splice and extend cable to new location.
5. Provide new feeder.

D. Additional work that contractor shall include in bid: Assume for all relocated panelboards, that in addition to any circuits called out on the drawings or in the specifications, that the following additional work shall be included:

1. For each panelboard, there are an additional five 20 amp, 1-pole circuits that must be extended to new location and be connected to circuit breaker.

2.5 REMOVED PANELS

A. For each of the indicated removed panels, assume there are 20 existing circuits in the panel which must be relocated to another panel in the vicinity that has space. Include all work associated with finding circuits, and extending those circuits to the new panel. Assume that a portion of those circuits comes in the top and through the bottom. For conduits that enter through the bottom, circuits may have to be intercepted at the nearest available device and circuit extended from that device to the new panelboard.

2.6 RELABELING OF EXISTING PANELS

A. Where there are existing panels in place, or existing panels in place being replaced by new, include new engraved plates for those panels indicating the new panel designations. Also include modifying the existing switchboard or power panel that feeds those panels and update those panels with new engraved nameplates indicating the new panel designation.

2.7 REINSTALLATION OF EXISTING GRID FIXTURES

A. Where existing lighting fixtures are reinstalled into a grid ceiling, provide the code required grid attachment clips, if they are not an integral part of the light fixture.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.
B. Verify that abandoned wiring and equipment serve only abandoned facilities.
C. Beginning of demolition means electrical & communication contractor accepts existing conditions.

3.2 PREPARATION

A. Coordinate utility service outages with Utility Company.
B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
C. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

D. Existing Fire Alarm Systems: Maintain existing system in service until new devices area accepted. Disable system only to make switchovers and connections. Notify Owner at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 CONNECTIONS TO EXISTING EQUIPMENT

A. Connections to existing panelboards, disconnects, wireways, transformers and switchboards shall be thoroughly investigated by the ELECTRICAL CONTRACTOR. For connections to existing panelboards "or existing panel in area" he shall provide circuit breakers or fusible units to be installed within the existing equipment.

3.4 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.
B. For all removed electrical equipment, assume responsibility for removing the conduit and wire feeding that equipment back to the nearest junction box (back to power source; i.e. MCC, panelboard or transformer). Remove all unused control wires and/or cable above demolished ceilings. All wire shall be removed back to the point of supply. If that equipment was connected to a circuit breaker, the wire to the circuit breaker shall be entirely removed and the circuit breaker shall be tagged as spare.
C. Assume that any circuits that are interrupted by the remodeling that require continued service shall be reconnected and routed around the remodeled area.
D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
E. Disconnect abandoned outlet boxes and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlet boxes which are not removed.
F. Disconnect and remove abandoned panelboards and distribution equipment. Extend existing circuits as required to new panelboard or other panelboards with space.
G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
H. Repair adjacent construction and finishes damaged during demolition and extension work.
I. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.
K. Check with Owner to determine if the Owner wants to retain the removed equipment. If so, move it to the Owner's storage, assumed not to be in the same building, but within 5 miles of site. If not, remove material and dispose of properly at own expense.

3.5 EXISTING CEILING WORK

A. In areas where existing ceilings are installed and must be removed and reinstalled to facilitate the installation of electrical equipment, assume responsibility for removal and reinstallation of ceiling tiles. Replace ceiling panels and tiles that are broken during this removal and reinstallation. The only time that the contractor shall be relieved of this responsibility is if it is so stated on the drawings.

3.6 RECONNECTION TO EXISTING CIRCUITS

A. Where it is indicated on the drawings as 'reconnect to existing circuit' assume that the note references reusing the panelboard circuit. Make determination if existing raceways and conductors are in place for that connection. Extend the circuit from the new equipment back to the point where conduit and wire are available. Coordinate with the demolition contractor to maintain conduits and conductors that the electrical contractor may require to remain in place for reuse. Provide new raceway supports, conduit extensions, and circuit extensions as required.

3.7 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment which remain or are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

C. Luminaries: Remove existing luminaries for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps and broken electrical parts.

3.8 ELECTRIC SERVICE REVISIONS

A. Coordinate electric service installation with building construction. Include in bid temporary costs associated with keeping the existing electrical service operating until the new service is installed.

B. Extend feeders from the existing electrical service, to the new distribution panelboards as shown on the floor plan. Connection to the existing main service panel shall be as follows:

1. Provide fusible or circuit breaker units, as applicable, to be installed within the existing service distribution switchboard. These units shall have the same interrupting capacity as the switchboard.
2. If there is no space or parts are no longer available for the existing service panel, as an option, provide separately mounted enclosed circuit breaker. This circuit breaker shall have the same interrupting capacity as the existing switchboard and shall have the line side attached to the switchboard/main service distribution board bussing. Determine the best method for connection in the field. Each new feeder protection device shall be appropriately labeled to indicate the load which it feeds.

C. Visit the site prior to bid to determine the best feeder routing, from the existing main service, to the new distribution panelboards. Route the conduit concealed where in finished areas. This routing may be above ceilings, in building tunnels. For exterior construction, mark all existing in ground utilities, trenching, backfilling, and site restoration back to original condition. Refer to other portion of this specification regarding the installation of underground conduit. Unless specifically shown on the plans, this underground conduit shall be galvanized rigid steel conduit. Conduits may not be on roof.

D. Work with the Owner to install the new electrical service within the Owner's use of the building. Assume that all power outages shall be done on an overtime basis and shall include the same in bid. Work with the Owner to determine if shut down can be accomplished on a day when the facility does not require power. Determine the best way to install the new service so as to provide a minimum of downtime.

E. All existing service entrance equipment that is no longer required shall be removed in its entirety. Any openings left in the walls or ceiling shall be patched back to the same type of wall surface as the existing. For ceiling penetrations provide insulation to match existing and hire approved roofing contractor to patch openings.

F. Separate existing neutral ground bond so that the remaining neutral ground bond is at the main service only.

G. Ascertain the best connection method for backfeeding existing main and make necessary modifications to existing switchgear to make that connection. If there are in-line current transformers, those current transformers shall be removed. Furnish and install cable jumpers or copper bus to provide capacity for the same amperage as the current switchgear bus.

3.9 EXISTING PANEL REMOVAL

A. Where existing panels are being removed as a part of the electrical construction, assume that all existing circuits within that panelboard shall be extended into the nearest panelboard.

1. Determine the circuit connections of the removed panels and provide all appropriate circuit breakers in the new panelboards.

2. Determine raceway routing of existing panelboard and include in bid the cost to extend those raceways and associated branch circuits to the new panelboard. Provide junction box above ceiling or in floor below as required to extend circuits.
3. For conduits that enter panelboard through floor, assume that you may be required to cut the floor at that location, extend the conduits, and provide new branch circuit conductors. As an alternate to this, intercept the termination point of the underground conduits and route circuits overhead to the new panelboard location.

3.10 REMOVAL NOTES ON DRAWINGS

A. The removal notes on the drawings are meant to aid the contractor to remove items that the contractor may normally leave in place because the room remains similar.
B. It is the intent that these removed devices are devices that are in addition to the other devices that must be removed, bypassed, etc. as a part of the demolition work.
C. Disconnect, remove, and close openings of all electrical equipment that serve functions in existing rooms when those rooms change function. Clarify this with the Owner and Architect prior to removal.

3.11 INSTALLATION

A. Re-install relocated materials and equipment.

END OF SECTION 26 05 02

SECTION 26 05 04 – DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including general and supplemental condition, apply to work of this section.

1.2 SYSTEM PRE-INSTALLATION INFORMATION

A. Provide system pre-installation information for all equipment indicated on the Project Documentation Submittal List. Information shall include:

1. Equipment:

a. Provide submittals for the following equipment:

1) Section 26 05 05 - THROUGH PENETRATION FIRESTOPPING
2) Section 26 05 19 - WIRE AND CABLE
3) Section 26 05 26 - GROUNDING
4) Section 26 05 34 - RACEWAYS
5) Section 26 05 35 - ELECTRICAL BOXES
6) Section 26 05 53 - ELECTRICAL IDENTIFICATION
7) Section 26 05 73 - ELECTRICAL SYSTEMS ANALYSIS
8) Section 26 09 23 - LIGHTING CONTROLS
9) Section 26 24 16 - PANELBOARDS
10) Section 26 27 26 - WIRING DEVICES
11) Section 26 27 28 - CIRCUIT AND MOTOR DISCONNECTS
12) Section 26 32 00 - STANDBY ENGINE/GENERATOR SET
13) Section 26 36 00 - GENERATOR TRANSFER SWITCH

2. Format:

a. Each section shall be submitted separately.

B. System installation information shall be updated to reflect the installed system. This updated information shall be included as a part of the final O&M manual.

C. Drawings shall be supplied for each existing building system that is revised or added to. The drawings do not have to show all existing building equipment, only those items where the new system is extended from. A brief description should be given of the existing system and how it was extended.

D. Record drawings shall be reduced to 11" X 17" or 8 1/2" x 11" and included with the equipment drawings in the final O&M manual. See O&M MANUAL Description in this specification section.

1.3 FINAL TESTS AND DEMONSTRATIONS

A. Test all work and all equipment installed to ensure its proper and safe operation. Check all interlocking and automatic control sequences, and test the operation of all safety and protective devices. Rectify all defects. Coordinate this work with the Power Company, supplier's representative and all other persons as directed by the OWNER or his representatives, in order to achieve the proper and intended operation of all equipment.

B. Test, adjust and record operating voltages at each system level before energizing branch circuits. Transformer taps must be adjusted to obtain as near as possible nominal system voltage. Where transformer is under Utility jurisdiction, obtain services of Utility to correct voltage. Be responsible for replacement of all devices and equipment damaged due to failure to comply with this requirement.

C. Balance load among feeder conductors at each panelboard, and reconnect loads as may be necessary to obtain a reasonable balance of load on each phase. Electrical unbalance shall not exceed 10%.

D. Provide all instruments and equipment necessary to perform required tests.

E. All checks and tests shall be permanently recorded and made available to the OWNER or his representatives. The tests shall include:

1. System grounding
2. Fuses:
   a. Equipment nameplate requirement
   b. Actual fuse rating
3. Breakers:
   a. Nameplate
   b. Actual rating
4. Motors:
   a. Complete nameplate data
   b. Overload relay element
   c. Voltage and current phase readings
   d. Direction of rotation
5. Ampere readings on any cable operating in parallel to insure an even division of current.

F. The above reading shall be made for all fuses, breakers, motors and parallel cables installed as part of this contract and connected to by Division 26. This testing shall be for all new equipment, whether furnished by the electrical contractor or not.

G. Upon request, demonstrate proper operation of all electrical systems and equipment in the presence of the Engineer's Consulting Electrical Engineer and/or other designated persons.

1.4 PROJECT CLOSEOUT CHECKLIST

A. Submit the following:

ITEM	SUPPLIED TO:	CHECK OFF
Generator test report. (SPEC 26 32 00)	ENGINEER	_____
Letter stating all specified spare equipment was delivered to owner. The letter should list the equipment supplied.	ENGINEER	_____
O&M Manual	ENGINEER	_____
Certificate from systems suppliers stating that the system was started up, tested and Owner's instructions were given. Certificate shall have date of instructions and test and shall have the owner's representative's signature.	ENGINEER	_____
Copy of marked up record drawing.	ENGINEER	_____
Provide warranty for all equipment	ENGINEER	_____

END OF SECTION 26 05 04

SECTION 26 05 05 – THROUGH-PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 APPLICABLE PUBLICATIONS

A. Fire Test Requirements

1. ASTM E-814, "Fire Tests of Through Penetration Fire Stops".
2. ANSI/ UL1479, "Fire Tests of Through Penetration Fire Stops"
3. ASTM E-119, "Fire Tests of Building Construction and Materials".
4. ANSI/ UL263, "Fire Tests of Building Construction and Materials".
5. ASTM E-84, "Surface Burning Characteristics of Building Materials".
6. ANSI/ UL723, "Surface Burning Characteristics of Building Materials".

B. References

1. Underwriters Laboratories (UL) of Northbrook, IL "Fire Resistance Directory".
   a. Through Penetration Firestop Systems (XHEZ)
   b. Fill, Void or Cavity Materials (XHHW)
   c. Firestop Devices (XHJI)
   d. Forming Materials (XHKU)
2. All major building codes:
   a. Uniform Building Code published by ICBO
   b. Standard Building Code published by SBCCI.
   c. National Building Code published by BOCA.
   d. International Building Code published by ICC.
3. National Fire Protection Association (NFPA) of Quincy, MA "NFPA 101: Life Safety Code".
4. National Fire Protection Association (NFPA) of Quincy, MA "NFPA 70: National Electrical Code".

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete firestopping installation as specified herein.

B. This section includes through-penetration firestop systems for electrical equipment and penetrations through the following fire-resistance rated assemblies, including both blank openings and openings containing penetrating items such as conduits, cabling, cable trays and bus duct:

1. Floor-ceiling assemblies.
2. Roof-ceiling assemblies.
3. Walls and partitions.
4. Smoke barriers.
5. Construction enclosing compartmentalized areas.

1.4 RELATED WORK ELSEWHERE

A. Division 26, – Electrical

1.5 SHOP DRAWINGS

A. Product Data: For each type of through-penetration firestop system product indicated.

B. System Drawings: Submit documentation from a qualified third-party testing agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Product Certificates: Certificate of conformance signed by manufacturers of through-penetration firestop system products certifying that products comply with requirements.

1.6 OPERATION & MAINTENANCE MANUALS (NONE)

1.7 QUALITY ASSURANCE

A. Provide through-penetration firestop systems that comply with the following requirements :

1. Firestopping tests are performed by a qualified, testing and inspection agency. A qualified testing and inspection agency is UL, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop system products bear classification marking of qualified testing and inspection agency.
3. Engage an experienced installer who is certified, licensed or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements. A manufacturer's willingness to sell its through-penetration firestop system products to Contractor or to an installer engaged by Contractor does not in itself confer qualifications on buyer.

B. Obtain through-penetration firestop systems for each type of penetration and construction condition indicated from a single manufacturer.

C. Through-penetration firestop systems shall be subjected to necessary inspections and tests.

D. Keep areas of work accessible until inspection by authorities having jurisdiction.

E. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL

A. Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Performance Requirements

1. Provide products that upon curing do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction.

2. Openings within walls and floors designed to accommodate cabling systems subjected to frequent cable changes shall be provided with re-enterable products specifically designed for retrofit.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through-penetration firestop systems (XHEZ) listed in Volume 2 of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Manufacturers listed in the UL Fire Resistance Directory – Volume 2.

2.3 MATERIALS

A. General: Use only through-penetration firestop system products that have been tested for specific fire-resistance-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
B. Latex Sealants: Single component latex formulations that upon cure do not re-emulsify during exposure to moisture.
C. Firestop Devices: Factory-assembled steel collars lined with intumescent material sized to fit specific outside diameter of penetrating item.
D. Firestop Putty: Intumescent, non-hardening, water resistant putties containing no solvents, inorganic fibers or silicone compounds.
E. Firestop Putty Pads: Intumescent, non-hardening putty pads to be installed on metallic and nonmetallic electrical switch and receptacle boxes to reduce horizontal separation between boxes to less than 24".
F. Wrap Strips: Single component intumescent elastomeric strips faced on both sides with a plastic film.
G. Firestop Pillows: Re-enterable, non-curing, mineral fiber core encapsulated with an intumescent coating contained in a flame retardant poly bag.
H. Mortar: Portland cement based dry-mix product formulated for mixing with water at Project site to form a non-shrinking, water-resistant, homogenous mortar.
I. Silicone Sealants: Moisture curing, single component, silicone elastomeric sealant for horizontal surfaces (pourable or nonsag) or vertical surface (nonsag).
J. Silicone Foam: Multicomponent, silicone-based liquid elastomers, that when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.

3.3 DELIVERY STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.
B. Accept equipment on site. Inspect for damage.
C. Protect equipment from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
D. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturer's labels identifying product and manufacturer, date of manufacture; lot number; shelf life, if applicable; qualified testing and inspection agency's classification marking; and mixing instructions for multicomponent materials.

E. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.

3.4 INSTALLATION

A. General Requirements: Install through-penetration firestop systems in accordance with "Performance Criteria" Article and in accordance with the conditions of testing and classification as specified in the published design.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration firestop systems products.

1. Seal all openings or voids made by penetrations to ensure an air and water resistant seal.
2. Protect materials from damage on surfaces subjected to traffic.

C. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

D. Clean all surfaces adjacent to sealed openings to be free of excess through-penetration firestop system materials and soiling as work progresses.

E. Project conditions

1. Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limitations recommended by manufacturer.
2. Do not install through-penetration firestop systems when substrates are wet due to rain, frost, condensation, or other causes.
3. Do not use materials that contain flammable solvents.
4. Do not install water-based or products that are conductive when wet in contact with energized electrical conductors. Exercise care when energizing penetrants.

F. Coordination

1. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
2. Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration firestop systems.
3. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.

G. Preparation

1. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.
2. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
3. Do not proceed until unsatisfactory conditions have been corrected.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 05

SECTION 26 05 19 – WIRE AND CABLE

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

1. NFPA 70 – National Electrical Code.
2. ANSI/TIA/EIA-568-B.2.

B. National Electrical Contractors Association (NECA), Standard of Installation, current edition.
C. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
D. Underwriters Laboratories, Inc. (UL).

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete and operable wire and cable system as indicated on the drawings and as specified herein.

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.
B. The following information shall be submitted in addition to the items listed above:

1. Manufacturer literature in scope to demonstrate compliance with the requirements of this specification.
2. Clearly identify the types of wire and cable proposed.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. Wire and cable manufacturers shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development and production in accordance with ISO 9001.
C. All materials, equipment, and parts shall be new and unused of current manufacture.
D. Provide all necessary accessories required for a complete and operable system.

1.8 WARRANTY

A. Wire and cable shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. Approved manufacturer:

1. Contractor's option.

B. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 WIRE AND CABLE – GENERAL PURPOSE (600V)

A. General:

1. Per Base Bid all conductors with ampacity of 100A or less shall be copper. Per Alternate Bid E-3 aluminum conductors are allowed for feeders with ampacity greater than 100A with exception of conductors feeding chiller, motors, generators, dimmer racks and elevator. Feeders for this equipment must be copper.
2. THWN or THHN general purpose building wire insulated with polyvinyl chloride (PVC) and covered with protective sheath of nylon intended for lighting and power circuits at 600 volts or less, in residential, commercial, and industrial buildings.
3. The wire shall be suitable for 90°C maximum continuous conductor temperature in dry locations and 75°C in wet locations and listed by Underwriters Laboratories for use in accordance with Article 310 of the National Electrical Code.

B. Conductors:

1. Class B or Class C stranded, annealed uncoated copper per UL Standard 83 or 1063.
2. Where aluminum conductors are allowed, aluminum alloy conductors shall be compact stranded conductors of a recognized Aluminum Association 8000 Series aluminum alloy conductor material (AA-8000 series alloy).

C. Insulation:

1. Each conductor shall be insulated with PVC and sheathed with nylon complying with the requirements of UL Standard 83 for Types THHN or THWN and UL Standard 1063 for Type MTW and CSA C22.2 No. 75 for T90 Nylon.
2. Types THWN or THHN shall comply with the optional Gasoline and Oil Resistance rating of UL Standard 83. The insulation shall also comply with UL requirements for 105°C Appliance Wiring Material.
3. The average thickness of PVC insulation, for a given conductor size, shall be as specified in UL Standard 83 for TWHN or THHN. The minimum thickness at any point, of the PVC insulation, shall be not less than 90 percent of the specified average thickness.
4. The minimum thickness at any point of the nylon sheath shall be as specified in UL Standard 83 for Types THWN or THHN.
5. Where aluminum feeders are allowed, insulation to meet requirements of XHHW-2 Standards.
6. The PVC insulation shall be applied tightly to the conductor and shall be free-stripping.

D. Identification:

1. The wire shall be identified by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL Symbol, type designations, and optional ratings. The wire shall also be identified as C (UL) Type T90 Nylon or TWN 75, FT1.

E. Tests:

1. Wire shall be tested in accordance with the requirements of UL Standard 83 for Types THWN or THHN wire and for the optional Gasoline and Oil Resistance listing; as Type MTW to UL Standard 1063 (stranded items): as AWM to UL Standard 758 (stranded items); and as C(UL) Type T90 Nylon or TWN75.

F. Usage:

1. General use power wiring, minimum size No. 12 AWG.
2. General use control wiring, minimum size No. 14 AWG.

2.3 WIRE AND CABLE – UNDERGROUND (600V)

A. General:

1. USE-2 or RHH, cross linked polyethylene insulated cables for use in circuits not exceeding 600 volts. Cables listed by UL as Type USE-2 and recognized for underground use in wet locations at a maximum continuous conductor temperature of 90°C in accordance with Article 338 of the National Electric Code.
2. UL listed as Type RHH or RHW-2 for general purpose wiring applications at maximum continuous conductor temperature of 90°C in dry locations (RHH) or 90°C in wet or dry locations (RHW-2).
3. Installed in air, conduit, or other recognized raceways in accordance with Article 310 of the National Electric Code.

B. Conductors:

1. Conductors shall be Class B stranded annealed uncoated copper per UL Standard 854 and 44.
2. A suitable separator over the conductor may be used at the option of the manufacturer.

C. Insulation:

1. Each conductor shall be insulated by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL Symbol, and type designations.

D. Tests:

1. Wire shall be tested in accordance with the requirements of UL Standard 8654 for Type USE-2, UL Standard 44 for Types RHW-2 or RHH.

E. Usage:

1. Underground power wiring, minimum size No. 12 AWG.

2.4 PORTABLE CORD GENERAL USE

A. All portable general use cords shall be SO type.

2.5 WIRING CONNECTORS

A. Polaris Type Mechanical Connectors:

1. 8 AWG and larger wire for all motor connections.

B. Spring Wire Connectors:

1. 10 AWG and smaller wire.

C. Compression Connectors (T&B Sta-Kon or equal):

1. Fire alarm wiring.
2. Control wiring.
3. For those devices that are not rated to accept stranded wire.

D. Cord Connectors. All cord connectors should be Kellums type using wire mesh cord restraint.
E. Provide watertight Crouse-Hinds or equal cord grips in appropriate areas.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that wire is in compliance with specifications.
B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Inspect wire for physical damage and proper connection.
D. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
E. Verify continuity of each conductor.
F. Feeder or branch circuits with ampacity greater than 100 amperes shall be tested after installation to measure insulation resistance of each conductor.

1. All equipment shall be disconnected and the wire ends shall be cleaned and dried.
2. Connect Megohmeter between conductor and a grounded point in the enclosure and energize until the reading stabilizes.
3. The Megohmeter reading for each conductor shall not be less than 10,000 Megohoms.

3.2 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base on contract drawings.
B. Identify conflicts with the work of other trades prior to installation of work.
C. Adjust system to satisfy field requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.
B. Maintain original quality and condition of wire while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

B. Pre-Installation:

1. Verify that mechanical work likely to damage wire has been completed.
2. Completely and thoroughly swab raceway prior to installation.
3. Verify that field measurements are as shown on drawings.
4. Wire and cable routing shown on drawings is approximate unless dimensioned. Route wire and cable to satisfy project conditions.
5. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.
6. Determine required separation between cable and other work.
7. Determine cable routing to avoid interference with other work.

C. Conductor Sizing:

1. Conductor sizes are based on copper.
2. Use conductor not smaller than No.12 AWG for power and lighting circuits.
3. Use No.10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.
4. Use No. 10 AWG conductors for 20 ampere, 277-volt branch circuits longer than 200 feet.
5. Where circuit wiring length exceeds 100 feet, increase wire size as needed to maintain a maximum voltage drop of three percent.
6. Use conductor not smaller than No.14 AWG for control circuits.
7. Wire and cable size shall be increased from size indicated or required by code to meet the following voltage drop requirements:

a. 3% drop for branch circuits.
b. 5% drop for motor circuits.

D. Wire Pulling:

1. Pull all conductors into raceway at same time.
2. No.4 AWG and larger wire and power cables shall be lubricated with pulling lubricant to reduce pulling tension and abrasion damage. The lubricant shall be water or wax based containing no oils or greases that may adversely affect cable jackets. Follow cable manufacturer's specifications regarding use of lubricant.
3. The minimum bend radius and maximum pulling tension ratings of the wire and cable shall not be exceeded.

E. Splices and Terminations:

1. Splices and terminations shall not be made within raceways.
2. Clean conductor surfaces before splicing or terminating.
3. Make splices, taps, and terminations to carry full amp capacity of conductors with no perceptible temperature rise.
4. Wire nuts, "ScotchLocks", and similar devices may be used to splice 120V power circuits.
5. Control, communication, and data transmission wire and cable shall not be spliced.
6. Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure. Do not rest cable on ceiling panels or support for the ceiling suspension system per NEC.
7. Neatly train and lace wiring inside boxes, equipment, and panelboards.
8. Clean conductor surfaces before installing lugs and connectors.
9. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
10. All aluminum conductors shall terminate on tin plated, aluminum-bodied compressor lug or compression adapter. An oxide-inhibiting joint compound must be applied on the aluminum conductor during termination. The compression connectors shall be installed according to manufacturers' instructions with the compression tool recommended by the manufacturer of the connector.
11. Perform an infrared survey of all aluminum conductor connections after the installation is complete and in normal service. Infrared surveys shall be performed during periods of maximum possible loading with at least 30% of rated load of the equipment being inspected. All connections with elevated temperatures shall be corrected by the contractor.
12. No copper-to-aluminum transitions permitted when splicing onto existing copper feeders.
13. Use polaris type mechanical connectors for copper conductor splices and taps, 8 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
14. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

F. Motors:

1. Motor wiring to motors less than 10 horsepower shall be spliced and terminated with fully insulated crimp-on end cap with a layer of self-vulcanizing rubber tape, followed by five layers of vinyl electrical tape. "SkotchLocks" and similar devices shall not be used.
2. Motor wiring to motors 10 horsepower or larger shall be spliced and terminated with crimp-on ring terminal lugs, brass nuts, bolts and washers with a layer of self-vulcanizing rubber tape, followed by five layers of vinyl electrical tape. "SkotchLocks" and similar devices shall not be used.

G. Wire Marking:

1. The ends of each conductor shall be marked with circuit number, motor number, wire or terminal number.
2. Labels shall be typed in black lettering with indelible ribbons on a white, heat shrink sleeve. Markers shall be shrunk around the wire to provide a tight, non-slip bond with a compatible heat gun.
3. Heat shrink wire markers shall be Brady Bradysleeve Type B-321 or B-322

	277/480V System	120/208V System	120/208 System
Phase A	Brown	Black	Black
Phase B	Orange	Red	Red
Phase C	Yellow	Blue	
Neutral	Gray	White	White
Ground	Green	Green	Green

H. Ground Wire Color Coding

1. Provide green insulated ground wire for #8 and smaller. #6 wire shall have green band per code.

I. Control Panels:

1. Control panel wiring. Wiring within control cabinets shall be stranded type MTW.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 19

SECTION 26 05 26 – GROUNDING

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.
B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.
C. Conform to current Telecommunication Industry Association (TIA/EIA).
D. Conform to National Electrical Contractors Association (NECA) "Standards of Installation".
E. Product specific standards and requirements are included in product specifications.
F. EIA/TIA-607.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete and operable grounding and bonding system as indicated on drawings and specified herein.
B. Ground and bond all equipment required per all applicable codes whether or not specifically shown on drawings.

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.
B. The following information shall be submitted in addition to items listed above:

1.6 OPERATION & MAINTENANCE MANUALS (NONE)

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

1.8 WARRANTY

A. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
C. Submit a written warranty executed by the installer indicating ground test was completed.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

B. Provide a complete and fully functional grounding system using materials and equipment of types, sizes, and rating as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions. Provide all accessories necessary for a fully functioning system.

2.2 GROUND RODS

A. Material: Copper-clad steel.
B. Diameter: 3/4" minimum.
C. Length: 10' minimum. Rod shall be driven at least 9'5"deep.
D. Use one or more ground rods to obtain the minimum specified ground resistance. This applies to manholes, padmount switches, transformers, service entrances, and all other equipment requiring a supplemental grounding electrode. Minimum of three ground rods shall be used to ground the service entrance as indicated on plans.

2.3 MECHANICAL CONNECTORS

A. The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers, and lockwashers shall be made of silicon bronze and supplied as a part of the connector body and shall be of the two bolt type.
B. Split bolt connector types are not allowed.
C. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

2.4 COMPRESSION CONNECTORS

A. The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99 percent.
B. The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.
C. The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.
D. The connectors shall be clearly marked with the manufacturer, catalog number, conductor size, and the required compression tool settings.
E. Each connector shall be factory filled with an oxide-inhibiting compound.

2.5 WIRE

A. Material: Stranded copper (aluminum permitted only with aluminum conductors).
B. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, in specifications, or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used on the same facility.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

3.2 FIELD MEASUREMENTS

A. Field verify exact routing of all backbone cable.
B. Adjust grounding system installation to satisfy field requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

3.4 INSTALLATION

A. General:

1. Provide a separate, insulated equipment grounding conductor in all raceways.
2. Connect grounding electrode conductors to metal water pipe:
    a. Use a suitable ground clamp.
    b. Make connections to flanged piping at street side of flange.
    c. Provide bonding jumper around water meter.
3. Supplementary Grounding Electrode:
    a. Use driven ground rod on exterior of building.
    b. Install ground rod in suitable recessed well; fill with gravel after connection is made.
    c. Effectively ground metal frame of the building.
    d. Install grounding conductor to footing rebar per NEC.
4. Provide ground wire in all surface metal raceways, and wireways.

B. Ground Rod Installation

1. Install ground rods to be 10'6" deep.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 26

SECTION 26 05 29 – SUPPORTING DEVICES

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.
B. Conform to current American National Standards Institute (ANSI) standards.
C. Conform to current American National Standards Institute ANSI B31.1 standards.
D. Conform to National Electrical Contractors Association (NECA) "Standards of Installation"

1.3 DESCRIPTION OF WORK

A. Furnish and install complete and operable support devices as required.
B. Metal supporting devices shall be zinc galvanized or cadmium plated steel or malleable iron.
C. Equipment and materials shall be supported with devices designed for such purpose. Wire or plastic ty-raps not acceptable.
D. Where so specified on the drawings, provide stainless steel, PVC covered, or hot dipped galvanized.
E. Refer to drawings or other portions of the specifications for particular pieces of equipment which may require more stringent equipment specifications than listed in this specification.

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS (NONE)

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 SUPPORTING STRUCTURES

A. Rack supports of galvanized steel channel sections with adequate feet to allow secure mounting. Weld sections, do not use bolts.

2.3 CONDUIT SUPPORTS

A. 1- hole galvanized steel straps for EMT, 2-hole galvanized steel straps for all other conduits. Do not use perforated hanger iron.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify locations prior to rough in.
B. Verify mounting details

3.2 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.
B. Accept equipment on site. Inspect for damage.
C. Protect equipment from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
C. Do not fasten supports to pipes, ducts, mechanical equipment, or other conduit.
D. Do not use spring steel clips on ceiling support wires.
E. Do not use powder actuated anchors.
F. Obtain permission from Engineer before drilling or cutting structural members.
G. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present a neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
H. Install surface mounted cabinets and panelboards with minimum of four anchors.
I. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
J. Use steel metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
K. Degrease and clean surfaces to receive nameplates and labels.
L. Install nameplate and label parallel to equipment lines.
M. Secure nameplates to equipment fronts using screws if so specified on drawings.
N. Anchors:

1. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31 and transfer of loading and stresses to connected equipment.
2. Installation methods shall be in conformity with manufacturer's recommendations for maximum holding power.

O. Conduit Supports

1. Support conduit as follows:

a. Vertical Surfaces: Galvanized, heavy-duty, sheet steel straps; back straps provided for exposed conduit and conduit on exterior walls.
b. Horizontal Surfaces: Single or double rack channel trapeze, complete with conduit straps as required; supported with threaded hanger rods.

2. Support 1 3/4 in. and larger conduit runs passing through floors at each floor with riser pipe clamps.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 29

SECTION 26 05 34 – RACEWAYS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.
B. Conform to current National Electrical Manufactures Association (NEMA) Standards.
C. Conform to current Underwriters Laboratories (UL) Specifications and Standards.
D. Conform to current Telecommunication Industry Association (TIA/EIA).
E. Conform to current American National Standards Institute (ANSI) standards.
F. Conform to National Electrical Contractors Association (NECA) "Standards of Installation".
G. Product specific standards and requirements are included in Product Specifications.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete and operable conduit/raceway system as indicated on the drawings and as specified herein.
B. All wire shall be in conduit or surface raceway. All conduits in finished areas shall be concealed. In unfinished areas, such as utility and mechanical rooms, the contractor shall conceal the branch wiring such as receptacles and light switches.
C. Where conduit passes through areas of differing temperatures, such as into or out of cool-rooms, freezers, unheated and heated spaces, buildings, provide listed conduit seals to prevent the passage of moisture and water vapor through the conduit.
D. When remodeling in existing construction, all conduit shall be concealed in walls, above ceiling, or below floors and located within building.
E. When remodeling in existing construction and it is impossible to conceal conduit, a surface metal raceway shall be used where the raceway is used for 110 volt or greater power, where subject to physical damage, and for fire alarm wiring.
F. Materials Included:

1. Metal conduit.
2. Flexible metal conduit.
3. Liquidtight flexible metal conduit.
4. Electrical metallic tubing.
5. Nonmetallic conduit.
6. Surface metal raceways.
7. Wireways.
8. MC cable.

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. All materials, equipment and parts are to be new, undamaged and unused of current manufacture.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 CONDUIT GENERAL REQUIREMENTS

A. Minimum Size: 1/2 inch.
B. Conduit types not listed below are prohibited.
C. Rigid heavy wall galvanized steel conduits:

1. Are to be used in the following locations:

a. Outdoors.
b. Underground, unless PVC is shown on drawings or called out in other portions of this specification.
c. In and under ALL concrete slabs, except for where PVC is allowed as stated in nonmetallic conduit portion of this specification.
d. In sizes 2-1/2" and larger, where the conduit is exposed and where it is installed between the floor and 8' AFF. Above this height EMT conduit may be used.
e. In areas having moisture, dust or gases.
f. Exposed conditions where such mechanical protection is required.

2. Manufacturer: CONTRACTOR option.
3. Conduit:

a. Impact and crush resistant mild steel tube with an accurate circular cross section, a uniform wall thickness, a defect free interior surface, and a continuous welded seam.
b. Interior and exterior surfaces thoroughly and evenly coated with zinc using the hot-dip galvanizing process.
c. Top-coated with a compatible organic layer to inhibit white rust and increase corrosion resistance.
d. Factory cut threads, 0.75-inch taper per foot, protected after cutting with an application of molten zinc.

4. Conduit Bodies:

a. Ferrous metal construction electro-galvanized inside and out and coated with aluminum acrylic paint.
b. Tapered, threaded hubs with integral bushing.
c. Stainless steel hardware.
d. Cover constructed of same material with solid gasket.

5. Fittings:

a. Ferrous metal construction electro-galvanized inside and out.
b. Components critical to performance such as set screws, split rings, and locknuts constructed of hardened steel or adequately designed to insure positive bonds.

D. IMC (Intermediate Metal Conduit) is applicable in place of rigid heavy wall galvanized steel conduit in the following locations:

1. All areas except primary raceways.
2. Outdoors.
3. Underground.

E. Thinwall conduit:

1. May be used in the following locations:
   a. Indoors in dry locations (walls, ceilings, exposed).
   b. In sizes 2 1/2" and larger, where installed above ceilings or installed more than 8' above the floor. See paragraph B - Rigid heavy wall conduit.
2. Manufacturer: CONTRACTOR option.
3. Conduit:
   a. Mild steel tube with an accurate circular cross section, a uniform wall thickness, a defect free interior surface, and a continuous welded seam.
   b. Interior and exterior surfaces thoroughly and evenly coated with zinc using the hot-dip galvanizing process.
4. Fittings:
   a. Setscrew, steel construction electro-galvanized inside and out.
   b. Insulated throat connectors.
   c. Components critical to performance such as set screws, split rings, and locknuts constructed of hardened steel or adequately designed to insure positive bonds.

F. Flexible Conduit:

1. Lengths limited to minimum necessary, 6' maximum.
2. Limit use to dry areas.
3. For connection of lighting fixtures, motors and similar equipment.
4. To contain an equipment grounding conductor with phase conductors.
5. Bond grounding conductor to equipment served and nearest conduit system junction box.
6. Manufacturer: CONTRACTOR option.
7. Usage:
   a. Use only in conjunction with electrical metallic tubing
8. Conduit:
   a. Single strip, helically wound, galvanized steel with smooth interior surface conforming to applicable UL Standards.
   b. Minimum size 1/2-inch may be used in lengths not to exceed 3-feet. All runs of flexible conduit shall be as short as practicable, of the same size as the conduit it extends and with enough slack to reduce the effects of expansion and vibration.
9. Fittings:
   a. Connectors shall be malleable iron or steel with insulated throat, squeeze-type, with annular gripping rib. Particular attention shall be given to maintaining ground bond and firm support through flexible connections. Connections shall have insulated throats.

G. Liquid Tight Flexible Conduit:

1. Requirements same as for flexible conduit.
2. Use in areas where environment is damp or could become damp or wet.
3. To contain an equipment grounding conductor with phase conductors. Bond grounding conductor to equipment served and nearest conduit system junction box.
4. Manufacturer: CONTRACTOR option.
5. Usage:

a. Use in conjunction with galvanized rigid metal conduit.
b. Use in conjunction with PVC coated galvanized rigid metal conduit.

6. Conduit:

a. Single strip, helically wound, galvanized steel core inside and outside with smooth interior surface with sunlight resistant thermoplastic jacket suitable for ambient environmental conditions conforming to applicable UL Standards.
b. Jacket shall be positively locked to core to prevent sleeving.
c. All runs of flexible conduit shall be as short as practicable, of the same size as the conduit it extends and with enough slack to reduce the effects of expansion and vibration.

7. Fittings:

a. Where used in conjunction with galvanized rigid metal conduit, connectors shall be malleable iron or steel, electro zinc plated, with insulated throat and taper threaded hub.
b. Where used in conjunction with PVC coated galvanized rigid metal or rigid aluminum conduit connectors shall be malleable iron or steel, electro zinc plated and PVC coated, with insulated throat and taper threaded hub.
c. Particular attention shall be given to maintaining ground bond and firm support through flexible connections.
d. All fittings shall be liquid tight.

H. Nonmetallic Conduit (PVC):

1. Where indicated on drawings.
2. In or under concrete slabs for 3 phase panelboards and 3 phase motor feeders only, NO single phase circuits or networks feeding single phase loads allowed.
3. PVC conduit may be used for low voltage wiring (24 volts or less), where allowed by code. PVC may not be used in plenum rated ceilings or if another type has been called out on the drawings.
4. Where PVC conduit penetrates floor, it must be installed per conduit installation detail.
5. PVC not allowed indoors above slab, except for single ground conductors in non-plenum areas.
6. Manufacturer:

a. Carlon.
b. Or equal.

7. Conduit:

a. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
b. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-2.
c. The conduit and fittings shall be homogeneous plastic material free from visible cracks, holes or foreign inclusions. The conduit bore shall be smooth and free of blisters, nicks or other imperfections, which could mar conductors or cables.
d. Conduit, fittings and cement shall be produced by the same manufacturer to assure system integrity.

8. Conduit Bodies:

a. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
b. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-3.
c. Stainless steel hardware.
d. Cover constructed of same material with solid gasket.

9. Fittings:

a. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
b. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-3.

I. MC Cable (May Not Be Used on this project)

2.3 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.
B. Intermediate Metal Conduit (IMC): Rigid steel.
C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit all steel fittings.

2.4 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.
B. Fittings: ANSI/NEMA FB 1.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.
B. Fittings: ANSI/NEMA FB 1 with insulated throats.

2.6 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.
B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron, insulated throat connectors.

2.7 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.
B. Fittings and Conduit Bodies: NEMA TC 3.

2.8 SINGLE CHANNEL SURFACE METAL RACEWAYS (WIREMOLD)

A. Description: Sheet metal channel with fitted covers suitable for use as surface metal raceways.
B. Size: As required. Maximum 40% fill.
C. Finish: International white.
D. Fittings: All fittings shall have bend radius controls in accordance with TIA/EIA category 6 standards. Boxes, extension rings. Furnish manufacturer's standard accessories.

2.9 WIREWAYS

A. Description: General purpose type wireway.
B. Knockouts: Bottom only.
C. Size: As required.
D. Cover: Hinged.
E. Connector: Slip-in.
F. Fittings: Lay-in type with removable top, bottom and sides with captive screws.
G. Finish: Rust inhibiting primer coat with gray enamel finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify routing and termination locations of conduit prior to rough in.
B. Verify conduit routing. Routing as shown on Drawings is in approximate locations unless dimensioned. Route as required to complete wiring system.

3.2 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base conduit rough-in or equipment locations on dimensions obtained from the contract drawings.
B. Identify conflicts with the work of other trades prior to installation of electrical equipment and conduit work.
C. Adjust conduit system installation to satisfy field requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.
B. Accept conduit on site. Inspect for damage.
C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
D. Protect PVC conduit from sunlight.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. All conduit shall be installed in building unless indicated otherwise.
4. All conduits stubbed into ceiling shall have end bushings.
5. Install conduit in accordance with NECA "Standard of Installation."
6. Install nonmetallic conduit in accordance with manufacturer's instructions.
7. Arrange supports to prevent misalignment during wiring installation.
8. Support conduit using coated steel or malleable iron straps, lay in adjustable hangers, clevis hangers, and split hangers.
9. Group related conduits: support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
10. Fasten conduit supports to building structure and surface under provisions of Section 26 05 29.
11. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
12. Do not attach conduit to ceiling support wires.
13. Arrange conduit to maintain headroom and present neat appearance.
14. Route exposed conduit parallel and perpendicular to walls.
15. Route conduit in and under slab from point to point.
16. Do not cross conduits in slab.
17. Maintain adequate clearance between conduit and piping.
18. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
19. Cut conduit square using saw or pipecutter; de burr cut ends.
20. Bring conduit to shoulder of fittings; fasten securely.
21. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cleaner and cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
22. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
23. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Hydraulic one-shot bender may be used to fabricate factory elbows.
24. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
25. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.
26. Provide suitable pull string in each empty conduit, except sleeves and nipples.

27. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
28. Ground and bond conduit under provisions of Section 26 05 26.
29. Identify conduit under provisions of Section 26 05 53.
30. Flexible metal conduit shall be used for connection to equipment subject to vibration and light fixture drops in all removable tile ceilings. Length shall not exceed 36" for equipment connections and 72" for light fixture connections. Minimum size 1/2", except 3/8" may be used for fixture drops. Install flexible conduit drops from independent junction box mounted above ceiling and accessible from below ceiling to recess ceiling mounted equipment. Allow for positioning of equipment to next tile increment.
31. Seal conduit with oakem or duct seal where they leave heated areas and enter unheated areas.
32. Surface raceway shall be installed to run parallel of all existing surfaces. Where raceway is used on ceiling, raceway shall be mounted at ceiling wall junction and extended from the junction box out to ceiling mounted device. Raceway shall be routed in corners and along mouldings to be as least obtrusive as possible.
33. Exterior cable and conduit installation.
    a. Layout in trench may be started at either end unless the drawings indicate that it is to pitch for drainage. In which case the layout should be started at the lowest end. The cable and conduit shall be pitched 1" per 100 feet.
    b. Include all excavation and backfill.
    c. Cable and conduit shall be a minimum of 30" deep.
    d. Cable and conduit shall be laid in a 6" sand bed and covered with another 6" of sand before backfilling with earth.
    e. Provide Brady identotape 12" above all buried conduits and cables.
    f. Provide #12 pull wire in all empty or spare conduits.
    g. Restore existing surface back to its original condition.
    h. For all excavation, maintain erosion protection per Federal, State, and municipal requirements. All work associated with erosion control for excavation shall be done as per Federal, State and municipal requirements, as well as any plans, meetings, and other special conditions.
    i. For all trenching that is under paved surfaces, backfill with structural material. Material shall be tapped in layers up to the point of the surface paving material.
34. For intermediate floor structural slabs, assume that conduit cannot be installed within the slab. If installing conduit within the slab, coordinate this with the Construction Manager and verify with the Architect prior to installation.
35. For on-grade slabs, the conduit may be run in or under the slab. Verify with concrete installation prior to running conduits in slab to determine if that conduit coordinates with the slab reinforcing.

B. Conduits Stubbed Into Ceiling Space

1. All conduits stubbed into ceiling shall have end bushings or insulated connectors.

C. Exterior Wall Penetrations

1. For all exterior wall penetrations, patch the wall with material to match the existing wall finish. The openings shall be as small as possible to minimize the impact on the existing wall finish. Install duct seal within the conduit to prevent air flow.
2. When conduits are rising from the ground to penetrate the walls, furnish rigid steel conduit where conduit is exposed, and deep-back LB's condulettes or NEMA 4X stainless steel junction box.

D. Interface With Other Products

1. Install conduit to preserve fire resistance rating of partitions and other elements.
2. Route conduit through roof openings for piping and ductwork or through suitable roof jack. Coordinate location with roofing installation.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 34

SECTION 26 05 35 – ELECTRICAL BOXES

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.
B. Conform to current National Electrical Manufactures Association (NEMA) Standards.
C. Conform to current Underwriters Laboratories (UL) Specifications and Standards.
D. Conform to National Electrical Contractors Association (NECA) "Standards of Installation".

1.3 DESCRIPTION OF WORK

A. Furnish and install boxes as indicated on drawings and specified herein.
B. The intent of this section is to limit the use of sheet steel boxes to small circuit wiring in dry locations for installations of outlets, switches, exhaust fans, lights, unit heaters, small overhead door units, small power outlets, and limiting the general circuit capacity of 50 amps or less.
C. Outlets, switches, controls and etc., installed on machinery or processes shall be served with FS and NEMA 12 type boxes.

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 BOXES

A. Pull boxes and junction boxes: Metal construction, conforming to National Electrical Code, with screw on or hinged cover.

B. Flush mounted pull boxes: Provide overlapping covers with flush head cover retaining screws, prime coated.

C. Small surface type junction boxes to be used in dry locations only for general purpose lighting and outlets shall conform to the following standard sizes and spec's:

1. All boxes and covers shall be made of stamped steel. (No sectional boxes allowed).
2. Minimum sizes:

a.	Handy boxes	4 x 2 1/8 x 2 1/8
b.	Octagon boxes	4 x 1 1/2
c.	4" sq. boxes	4 x 1 1/2 or 4 x 2 1/8
d.	4 11/16" sq. boxes	4 11/16 x 2 1/8

D. Flush mounted outlet boxes used in dry locations shall conform to the following standards:

1. All boxes and covers shall be made of stamped steel. No sectional boxes allowed.
2. All boxes for communications outlets and blank outlets shall be of the "deep" variety.
3. Minimum sizes:

a. Masonry boxes: minimum 3 1/2" deep, gang as required. These can be used for outlets or blank outlets.

b. 4" square wiring device boxes: 2 1/8" deep when used for communication or blank outlets. 1 1/2" or 1 1/8" deep when used for wiring devices. All 4" square boxes shall be equipped with square cut 1" raised covers of appropriate depth.

c. Note special requirements for boxes that will be used in corrosive atmospheres, such as pools. In these atmospheres use corrosion resistant (PVC) outlet boxes.

d. Note special requirements for flush boxes for outside receptacles. These boxes shall be 4-hole type or other type to properly patch the surface weather tight covers.

E. Junction and Splice Boxes:

1. Screw covers, galvanized after fabrication and not less than code dimensions.
2. Entry openings in boxes shall be made with knock-out punch tool or hole saws.
3. Burning of entry openings with a torch will not be acceptable.
4. Paint exposed ferrous surfaces, 2 coats rust resisting paint.

F. Provide outlet box divider barriers between 277/480 and 120/208 devices per N.E.C. and between switches for emergency and non-emergency circuits.

G. Flush interior devices shall utilize 4" square box with raised covers or deep masonry boxes as appropriate.

H. Raised covers to have square cut corners.

I. Where existing boxes are reused, provide add-a-depth device rings to devices installed without proper box depth to finish surface.

J. Box extensions will not be allowed.

K. Through the wall type outlet boxes not allowed.

L. Junction boxes and pull boxes shall not have knockouts. Enclosure type, material, and dimensions shall be as indicated on the drawings and as stated in these specifications. Where no type or size is indicated for junction boxes and pull boxes, they shall be one size larger than required by NEC.

M. For exterior outlets, such as receptacles, use FS type outlet box flush mounted.

N. Large junction boxes shall be constructed from steel in the following gauges:

Box Size	Minimum Steel Gauge
Up to 24" x 30" x 12"	14
24" x 36" x 8" to 36" x 36" x 16"	12
36" x 42" x 8" and larger	11

O. Boxes that are shown on hollow-core, precast concrete shall be flush mounted into the spancrete unless shown otherwise on drawings. Coordinate opening to be in hollow core. Provide opening.

2.3 SURFACE METAL RACEWAY BOXES (eg. Wiremold)

A. All outlet and junction boxes used with surface metal raceway shall be manufactured by the surface metal raceway manufacturer to be compatible with the raceway used.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify routing and termination locations of conduit prior to rough in.

3.2 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.
B. Mounting heights:

1. As shown on drawings and details.
2. Coordinate exact heights with specific manufacturer's recommendations.
3. All mounting heights of keypads and pushbuttons to be ADA compliant.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.
B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

B. All fire alarm pull and junction boxes and their covers shall be painted red and have "fire alarm" written on the cover in large black non-washable ink. The lettering shall be such that it can be read from 10' away. Note that this requirement is in addition to the NEC requirements which requires that the box itself be marked in red.
C. Boxes that are being installed in rough masonry surfaces (such as split face block) shall be installed in such a manner to allow the wiring device or light fixture and the associated device plate to be seated squarely. Have the masonry opening cut to the size of the plate and then box grouted in, or the rough masonry around the box shall be chiseled away and mortar installed around the box to provide a flat finish.
D. Coordinate with the masonry installation all details of installation on rough masonry surfaces. Without coordination assume responsibility for all costs to provide the flat surface, which will require chiseling the surface of the rough masonry away and providing mortar to obtain this smooth finish.
E. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
F. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
I. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods compatible with NFPA.
J. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices with each other.
K. Use flush mounting outlet boxes in finished areas.

L. Do not install flush mounting boxes back to back in walls; provide minimum 6 inch separation. Provide minimum 24 inches separation in acoustic rated walls.
M. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
N. Use stamped steel bridges to fasten flush mounting outlet box between studs.
O. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
P. Use adjustable steel channel fasteners for hung ceiling outlet box.
Q. Do not fasten boxes to ceiling support wires.
R. Support boxes independently of conduit.
S. Use gang box where more than one device is mounted together. Do not use sectional box.
T. Use cast outlet box in exterior locations exposed to the weather and wet locations.
U. Large Pull Boxes: Boxes larger than 100 cubic inches in volume or 12 inches in any dimension.

1. Interior Dry Locations: Use hinged enclosure.
2. Other Locations: Use surface mounted cast metal box.

V. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

W. Interface With Other Products

1. Coordinate masonry cutting to achieve neat opening.
2. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.
3. Position outlet boxes to locate luminaires as shown on reflected ceiling plan.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 35

SECTION 26 05 37 – LOCATION OF OUTLETS AND EQUIPMENT

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.
B. Conform to National Electrical Contractors Association (NECA) "Standards of Installation".

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete installation as indicated on the drawings and as specified herein.
B. This specification lays out the general requirements for heights of devices. Heights of devices may be required to be changed depending on interferences in the walls or interferences with mechanical or other engineerural equipment. Assume responsibility for verifying the existing conditions in the room by reviewing mechanical and engineerural drawings so as not to interfere with that equipment.
C. Verification of door swings: Assume responsibility to verify door swings with the engineerural plans prior to outlet box installation. Review if the switch location is such that it can be easily accessed upon opening the door.

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS (NONE)

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. All materials, equipment and parts are to be new, undamaged and unused of current manufacture.
C. All boxes to be plumb and level.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 2 years from the date of commissioning against defects in material and workmanship.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 EQUIPMENT

A. Specifications for equipment being installed under conditions set forth in this section shall be found in related work elsewhere.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify installation locations suitability and adjust as directed.

3.2 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings.
B. Mounting heights:

1. As shown on drawings and details.
2. Coordinate exact heights with specific manufacturer's recommendations.
3. All mounting heights of keypads and pushbuttons to be ADA compliant.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section prior to installation.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.

B. Grounding:

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

C. Location:

1. Location of outlets and equipment as shown on plans is approximate. Verify exact location determined by:

a. Construction or code requirements.
b. Conflict with equipment of other trades.
c. Equipment manufacturer's drawings.

2. Minor modification to the location of outlets and equipment is considered a part of this specification and shall be made with no additional compensation.
3. Mounting heights for all devices and equipment to be measured from finished floor to center of device and unless otherwise noted on plans shall be as follows:

Switches 42"

D. Receptacles below counter: Verify the actual mounting height with engineer. Determine if device is to fit into knee space and rough-in accordingly.

END OF SECTION 26 05 37

SECTION 26 05 53 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.
B. Conform to National Electrical Contractors Association (NECA) "Standards of Installation".

1.3 DESCRIPTION OF WORK

A. Furnish and install complete labeling as specified herein.
B. All major pieces of electrical equipment shall have engraved labels indicating their functions. This shall include the following:

1. All pushbuttons shall have labels that are engraved as to its function.
2. All relay cabinets shall indicate what the relay cabinet's function is.
3. All bypass relay enclosures.
4. All panelboards, disconnects, switches, and transfer switches shall have engraved labels indicating their functions.
5. Provide engraved tags for all special pull and junction boxes that are associated with the building special systems.
6. Provide engraved tags for all systems keys.

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATIONS & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 ENGRAVED LABELS

A. Where the words "provide engraved label" appears on the drawings or in the specifications, it shall mean that the label shall be an engraved 3-layer phenolic label with black letters on white material, unless other colors are called out on the drawings or details.

B. The label size shall be a minimum of 3/4" high and be 3" long. Labels may be attached with double backed adhesive tape unless indicated otherwise.

C. Where references are made on the drawings to provide engraved labels, engraved nameplate or engraved plates, these should be engraved phenolic labels.

2.3 ENGRAVED PLATES

A. Where references are made to engraved plates, this shall mean that the normal device plate shall have an engraving on it with black letters so as to indicate what this switch or device is used for.

2.4 BRANCH CIRCUIT OUTLETS: LABELING

A. Each branch circuit outlet, receptacles, lighting, and any other device requiring 120/208/277 or 480 volt power, the contractor shall:

1. Provide circuit, written in pencil or non-washable ink, inside of outlet box in an area that can be easily viewed when removing outlet faceplate.
2. Write circuit number in ink on device between receptacles under plate.
3. Optional: Provide typed label (not dyno label) for each circuit attached to device plate.
4. Label each junction box outlet cover in non-washable marker as to circuit number routed through junction box.

2.5 PANELBOARDS: LABELING

A. Panelboard Directory:

1. Prepare and affix a typewritten directory to the inside cover of each panelboard indicating loads controlled by each circuit.
2. Each distribution and lighting panelboard shall be equipped with a typewritten directory accurately indicating rooms and/or equipment being served.
3. Assume that originally directories will have to be developed based on the room numbers on the project drawings.
4. Near project completion, all directories will have to be changed to reflect actual room numbers as designated by the building occupant.
5. Include the cost of doing the original handwritten directory and revisions to the directory based on occupant room numbers.
6. Each existing panelboard that is revised, modified or has had circuits deleted or added to, shall have its directories retyped to reflect existing circuits and all modified circuits.
7. Each changed circuit on existing panelboards shall have an asterisk next to the revised or modified circuits.

B. Panelboard Identification:

1. Label per NEC 210.5.
2. Identify each panel with a suitably engraved nameplate mounted at the top of the front cover.
3. The nameplates shall be made of laminated black and white plastic with white on the outside.
4. The lettering shall be 1/4 inch high (minimum), engraved by cutting through the white outside layer so that the letters appear black.
5. Fasten nameplates with brass or stainless steel panhead screws.
6. Nameplate engraving shall match the numbers or letters shown on the drawings or assigned by the Owner's Representative.
7. Labels shall be engraved as to the function of the circuit breaker.
8. Labels shall also be engraved to indicate the load served by the circuit breaker.

C. Identify the source of the feeder circuit serving the panelboard.

2.6 POWER DISTRIBUTION PANELS

A. Each power panel that does not have a front hingeable door shall have an engraved laminated label attached adjacent to each circuit breaker.

B. The label shall be engraved as to the function of that circuit breaker and the load served by that circuit breaker.

C. For connections to existing switchboards in panel, provide engraved label for new circuit breaker and provide engraved labels for those circuit breakers that are modified.

2.7 STARTERS, DISCONNECTS AND VFD'S

A. Each starter, disconnect, and VFD furnished by this section or furnished by other sections but installed by this section shall have an engraved laminated label indicating which piece of equipment it controls.

B. This requirement is waived if the disconnect or starter is attached directly to the piece of equipment that it is controlling or operating.

2.8 FIRE ALARM SYSTEM

A. Each new fire alarm system junction and pull boxes and covers shall be identified by having it marked with red paint. Additional identification shall be included as follows:

1. The flat cover shall also be painted red with the words "Fire Alarm" clearly indicated on it.
2. The letters shall be a minimum of 1 1/2" high.
3. Handwritten letters may be used above ceilings or where otherwise concealed, stenciled covers shall be used where exposed, such as closets, mechanical rooms, etc.
4. This marking is in addition to the NEC required marking.

2.9 TERMINAL AND PULL BOXES

A. Those devices as indicated as terminal boxes, junction, or pull points that have internal terminal strips. Each terminal box shall:

1. Be identified on the outside of its cover as to its function.
2. Have an engraved laminated label attached to the outside of its cover which identifies its function.
3. Have terminal strips permanently marked with a numbering system that corresponds to the drawings furnished for the system.
4. Have each wire terminating on the terminal strip identified as to its wire number which is identified on the wiring diagram for this system.

B. Refer to wire marker, this section, as to the type of wire number required.

2.10 MISCELLANEOUS

A. Branch circuits

1. On branch circuits, use shall be made of all standard wire insulation colors available.
2. Where wires of different systems junction in a common box, each cable shall be grouped with its own system and identified using tags or identification strips.

B. Special systems

1. All control, instrumentation, graphic display, alarm and other special system wires shall be clearly identified by description and location, using tags or identification strips.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces are cleaned and ready to receive labels.

B. Verify labels are correct.

C. Verify that labels are installed as specified, level and plumb.

3.2 FIELD MEASUREMENTS (NONE)

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

3.4 INSTALLATION

A. General:

1. Degrease and clean surface prior to installing labels.
2. Install nameplate and label parallel to equipment lines.
3. Secure nameplates to equipment fronts using screws, if so specified on drawings.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 05 53

SECTION 26 05 73 – ELECTRICAL SYSTEMS ANALYSIS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work under this Section.

1.2 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.

1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

   a. NFPA 70 - National Electrical Code.
   b. NFPA 70E - Standard for Electrical Safety in the Workplace

2. Institute of Electrical and Electronics Engineers (IEEE), Specifications and Standards, current edition:

   a. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
   b. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings
   c. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
   d. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis
   e. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
   f. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations

1.3 DESCRIPTION OF WORK

A. Provide this study prior to ordering the distribution equipment so necessary change in distribution equipment can be made.

B. Furnish short-circuit and protective device coordination studies for the entire electrical distribution system.

C. Furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current issue of NFPA 70E -Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 - 2002, the IEEE Guide for Performing Arc-Flash Calculations.

D. The electrical power system studies shall encompass the following electrical equipment:

1. All distribution panelboards, lighting and appliance panelboards, generators, and automatic transfer switches shown on the one-line diagram

1.4 RELATED SECTIONS - NOT USED

1.5 SUBMITTALS

A. Submit shop drawings in accordance with Section 26 05 04.

B. Preliminary short-circuit and protective device coordination studies shall be submitted and approved prior to the approval of any electrical equipment submittals that may be affected by the results of the study.

C. Final short-circuit, protective device coordination, and arc flash hazard analysis studies shall be prepared and submitted based upon actual installed system characteristics.

D. Submit the following information specifically for Electrical Systems Analysis:

1. The results of the short-circuit, protective device coordination, and arc flash hazard analysis studies shall be summarized in a final report. A minimum of five (5) bound copies of the complete final report shall be submitted. Electronic PDF copies of the report shall be provided.
2. The report shall include the following sections:
    a. Executive Summary including Introduction, Scope of Work and Results/Recommendations.
    b. Short-Circuit Methodology Analysis Results and Recommendations
    c. Short-Circuit Device Evaluation Table
    d. Protective Device Coordination Methodology Analysis Results and Recommendations
    e. Protective Device Settings Table
    f. Time-Current Coordination Graphs and Recommendations
    g. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
    h. Arc Flash Labeling section showing types of labels to be provided. Section shall contain descriptive information as well as typical label images.
    i. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.
3. Submit an electronic version of the software model used to prepare the final short-circuit, protective device coordination, and arc flash hazard analysis studies.

1.6 FACTORY TESTING - NOT USED

1.7 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

1.8 QUALITY ASSURANCE

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.
B. The Registered Professional Electrical Engineer shall be an employee of the approved engineering firm.
C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.
D. The approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analyses it has performed.
E. The studies shall be performed using SKM Systems Analysis Power*Tools for Windows (PTW) software program or an approved equivalent software tool.

PART 2 - PRODUCTS

2.1 DATA COLLECTION

A. Field data collection shall be performed by a technician, qualified (as defined by NFPA 70E - 2004) to ensure accurate equipment modeling. The technician shall have completed an 8-hour instructor-led Electrical Safety Training Course. The course shall include NFPA 70E training which includes the selection and use of personal protective equipment.

B. The technician shall visually inspect to verify the equipment ratings, conductor ratings and overcurrent device data by removing panels, covers and doors where required to document the necessary data used in the analysis. The technician shall be qualified to perform these inspections with the equipment energized provided the incident energy values are less than 40cal/cm², greater values or unusual site conditions will require an equipment shutdown so the equipment can be inspected de-energized.

C. The Owner or Contractor shall provide qualified personnel to show the technician the equipment locations and to open all equipment doors, locks, etc. necessary to collect nameplate data.

D. Verify one-line drawings and provide marked corrections where discrepancies are found..

E. Data collection shall begin downstream from the utility service and continue down through the electrical distribution system as defined under scope of work. The study shall not include any single phase AC circuits or DC distribution systems as these types of circuits and systems are excluded from IEEE 1584-2002 Arc Flash calculation guidelines. The study need not include equipment rated 240 volts or less per NFPA 70E, when supplied by a single transformer rated less than 125kVA.

F. Obtain from the utility the minimum, normal, and maximum operating service voltage levels, three-phase short circuit MVA and X/R ratio, as well as line-to-ground short circuit MVA and X/R ratio at the point of connection as shown on the drawings.

2.2 SHORT-CIRCUIT ANALYSIS

A. Transformer design impedances shall be used when test impedances are not available.

B. Provide the following:

1. Calculation methods and assumptions
2. Selected base per unit quantities
3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis
4. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
5. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
6. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.

D. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short circuit ratings
2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses
3. Identify in writing, any circuit protective devices improperly rated for the calculated available fault current.

2.3 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B. Include on each TCC graph, a complete title with descriptive device names.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:

1. Electric utility's overcurrent protective device
2. Medium voltage equipment overcurrent relays
3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
6. Medium voltage conductor damage curves
7. Ground fault protective devices, as applicable
8. Pertinent motor starting characteristics and motor damage points, where applicable
9. Pertinent generator short-circuit decrement curve and generator damage point
10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Provide the following:

1. A one-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram
5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
6. Identify in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.4 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis and the protective device time-current coordination analysis.

B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

C. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.

D. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.

E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations

F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

G. The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

H. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 5 cycles.

I. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.

J. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

K. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

L. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

M. Provide the following:

1. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.

a. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.

1) The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.

PART 3 - CONSTRUCTION METHODS

3.1 FIELD ADJUSTMENT

A. The Contractor or equipment manufacturer's start-up technician shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

B. The Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

C. Square D shall notify Owner in writing of any required major equipment modifications.

3.2 ARC FLASH LABELS

A. Provide a 4.0 in. x 4.0 in. thermal transfer type label of high adhesion polyester for each work location analyzed.

B. The labels shall be designed according to the following standards:

1. UL969 - Standard for Marking and Labeling Systems
2. ANSI Z535.4 - Product Safety Signs and Labels
3. NFPA 70 (National Electric Code) - Article 110.16

C. The label shall include the following information:

1. System Voltage

a. Flash protection boundary
b. Personal Protective Equipment category
c. Arc Flash Incident energy value (cal/cm^2)
d. Limited, restricted, and prohibited Approach Boundaries

1) Study report number and issue date

D. Labels shall be printed by a thermal transfer type printer, with no field markings.

E. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:

1. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.
2. Wall Mounted Equipment - Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
3. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

F. Label Installation

1. Labels shall be field installed by the Contractor. The technician providing the installation shall have completed an 8-Hour instructor led Electrical Safety Training Course with includes NFPA 70E material including the selection of personal protective equipment.

3.3 TRAINING - NOT USED

END OF SECTION 26 05 73

SECTION 26 09 23 – LIGHTING CONTROLS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 National Electrical Code.
B. Conform to current National Electrical Manufactures Association (NEMA) Standards.
C. Conform to current Underwriters Laboratories (UL) Specifications and Standards.
D. Conform to current NEMA Enclosure Standards.
E. Conform to NEMA Standard WD-7-2000.

1.3 DESCRIPTION OF WORK

A. Furnish and install a complete lighting control system as shown on the drawings and as specified herein. This equipment shall provide the following functions:

1. Control of emergency lighting through the use of bypass relays when generator runs.
2. Control of other lighting as shown on the drawings.
3. Control of exterior lighting and select interior lighting with relays controlled by building automation system.
4. Dual technology, PIR and ultrasonic motion sensor lighting controls.
5. Photo sensors

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.
B. The following information shall be submitted in addition to items listed above:

1. Wiring diagram indicating wire size and type for each individual piece of equipment.
2. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
3. Submittal drawings are required for the following systems. They shall include the following:

a. Dual technology, Passive infrared and ultrasonic lighting controls.

1) Drawing showing all switches, and sensors and connections between all devices and lighting circuits.
2) Cut sheets on components.
3) Proper circuit numbers shall be shown on drawings.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. All materials, equipment and parts shall be new and unused of current manufacture.
C. Provide all necessary accessories required for a complete and operable system.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

PART 2 - PRODUCTS

2.1 NON DIGITAL LIGHTING CONTROL DEVICES

A. The lighting controls for this facility consist of two separate systems. One for digital diming with integrated digital devices to include dimming switches, motion sensors, photo sensors and emergency bypass. Where wall box dimmers are shown on plans, provide digital components. The second includes non-digital devices for areas served without digital system wall box dimmers.

B. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

C. Furnish and install complete lighting control system as specified in these specifications and on the drawings. Exact quantities and equipment configurations to be determined by plans, specifications, control schedules, and as required by manufacturer to make a complete and operating system.

2.2 BYPASS RELAYS/CONTACTORS

A. Function: It is the intent that the bypass relay provide bypass system to normal switching when there is a power fail and the generator runs. This shall be accomplished with the use of a UL924 listed emergency power bypass device. See detail on drawings.

B. Acceptable manufacturers: Wattstopper – ELCU-200 or equal. Bypass relay must interface with photo sensor, motion sensor and dimming system components.

C. Review the drawings to determine the location of the bypass relay panels. Each bypass relay shall be provided adjacent to a panelboard and an engraved red label shall be provided indicating its function. The label should describe the area of lighting bypass; i.e. gymnasium, IMC, etc.

D. The low voltage relay submittal drawings shall include, as part of the drawing submittal, the low voltage relays showing all interconnections.

2.3 DUAL TECHNOLOGY CEILING MOUNTED LIGHTING CONTROL

A. Provide dual technology type lighting controls in all areas unless directed to use single technology ultrasonic or passive infrared technology.

B. Provide second contact in all sensors to accommodate HVAC interface.

C. Determine proper sensor type and relay for direct connection requirements. Provide appropriate units.

D. Employ the services of a manufacturer's appointed representative to assist in making the proper adjustments on the motion detector installation. Meet with this person prior to making installation to determine if the locations shown are appropriate for the type of device being furnished. Make modifications in the locations for the devices, if required, to provide a more adequate installation.

E. Modify time settings, sensitivity settings, and "initial on" and "keep on" controls as necessary, and as required for the space. Default time of 15 minutes "keep on" time will be used at initial activation.

F. Installation assistance:

1. Include time in bid to work with the Owner and manufacturer to determine the proper time setting and sensor setting for each of the motion switches.
2. Each of the switches shall be set for the type of space in which they operate.
3. Include time in bid to have the manufacturer's representative come on site and review the job to determine what the expected settings are for the equipment.

G. Zero crossing relay controls shall be supplied.

H. Dual technology occupancy sensors shall be capable of detecting presence in the floor area by detecting doppler shifts in transmitted ultrasound and passive infrared heat changes.

I. Ultrasonic sensing shall be volumetric in coverage.
J. Passive infrared sensing shall utilize a multi-element fresnel lens to ensure that the sensor is insensitive to short-wavelength infrared waves such as those emitted by the sun. Lens shall have grooves facing in to avoid dust and residue build up which affect ir reception.
K. Both technologies shall sense presence in floor area before lighting will turn on. Detection by either technology shall hold lighting on for set period of time.
L. Sensors shall have time-out adjustment from 15 seconds to 35 minutes. Sensor shall not have settings exceeding 35minutes.
M. Sensors shall cover 2000 square feet with standard lens and 90 linear feet with long-range lens for walking motion in corridors. Coverage meeting NEMA Standard WD 7-2000 will be required.
N. Sensors shall be capable of being networked to achieve adequate coverage.
O. Sensors shall have an isolated relay rated at 24VDC that can be used to interface with HVAC, EMS, and other monitoring systems.
P. Each sensing technology shall have independent sensitivity adjustments, time adjustments and led display.
Q. Sensitivity and timer control shall be accessible on the front of the sensor. Sensor shall incorporate an accessible, but recessed on/override device.
R. Sensors shall operate on 24VDC.
S. Power supply shall be provided by a power pack that consists of a transformer and contact relay in one unit.
T. Provide 18 gauge plenum rated cable for interconnection of centers to relays.
U. Sensor shall have standard 5 year warranty and shall be UL listed.
V. Approved venders are Watt Stopper or equal

2.4 ULTRASONIC CEILING MOUNTED LIGHTING CONTROL

A. Where so indicated, provide an ultrasonic lighting control.
B. Provide second contact in all sensors to accommodate HVAC interface.
C. Determine proper sensor type and relay for direct connection requirements. Provide appropriate units.
D. Employ the services of a manufacturer's appointed representative to assist in making the proper adjustments on the motion detector installation. Meet with this person prior to making installation to determine if the locations shown are appropriate for the type of device being furnished. Make modifications in the locations for the devices, if required, to provide a more adequate installation.
E. Modify time settings, sensitivity settings, and "initial on" and "keep on" controls as necessary, and as required for the space. Default time of 15 minutes "keep on" time will be used at initial activation.
F. Installation assistance:

1. Include time in bid to work with the Owner and manufacturer to determine the proper time setting and sensor setting for each of the motion switches.
2. Each of the switches shall be set for the type of space in which they operate.
3. Include time in bid to have the manufacturer's representative come on site and review the job to determine what the expected settings are for the equipment.

G. Zero crossing relay controls shall be supplied.
H. Ultrasonic sensing shall be volumetric in coverage.
I. Ultrasonic occupancy sensors shall be capable of detecting presence in the floor area by detecting doppler shifts in transmitted ultrasound.
J. Sensors shall have time-out adjustment from 15 seconds to 35 minutes. Sensor shall not have settings exceeding 35minutes.
K. Sensors shall cover 2000 square feet with standard lens and 90 linear feet with long-range lens for walking motion. Coverage meeting NEMA Standard WD 7-2000 will be required.
L. Sensors shall be capable of being networked to achieve adequate coverage.
M. Sensors shall have an isolated relay rated at 24VDC that can be used to interface with HVAC, EMS, and other monitoring systems.

N. Sensors shall have adjustable ultrasonic sensitivity sensor shall have independent sensitivity adjustments, time adjustments and led display.
O. Sensitivity and timer control shall be accessible on the front of the sensor. Sensor shall incorporate an accessible, but recessed on/override device.
P. Sensors shall operate on 24VDC.
Q. Power supply shall be provided by a power pack that consists of a transformer and contact relay in one unit.
R. Provide 18 gauge plenum rated cable for interconnection of centers to relays
S. Sensor shall have standard 5 year warranty and shall be UL and CUL listed.
T. Approved venders are Watt Stopper or equal.

2.5 AUTOMATIC PASSIVE INFRARED WALL SWITCH LIGHTING CONTROL

A. Where so indicated, provide a passive infrared wall switch lighting control.
B. Determine proper sensor type and relay for direct connection requirements. Provide appropriate units.
C. Employ the services of a manufacturer's appointed representative to assist in making the proper adjustments on the motion detector installation. Meet with this person prior to making installation to determine if the locations shown are appropriate for the type of device being furnished. Make modifications in the locations for the devices, if required, to provide a more adequate installation.
D. Modify time settings, sensitivity settings, and "initial on" and "keep on" controls as necessary, and as required for the space. Default time of 15 minutes "keep on" time will be used at initial activation.
E. Installation assistance:

1. Include time in bid to work with the Owner and manufacturer to determine the proper time setting and sensor setting for each of the motion switches.
2. Each of the switches shall be set for the type of space in which they operate.
3. Include time in bid to have the manufacturer's representative come on site and review the job to determine what the expected settings are for the equipment.

F. Confirm compatibility with all ballasts and fans used in conjunction with passive infrared wall switch.
G. Zero crossing relay controls shall be supplied.
H. Switch shall have processing capabilities designed to prevent false offs and false triggers.
I. Single relay and dual relay models shall be available. Dual relay models shall provide zero crossing relay controls only on the primary relay.
J. Load range 25 to 600 watts at 120 volts and 60 to 1200 watts at 277 volts.
K. Coverage area shall be 300 Sq. Ft.
L. Switch shall have integral light level sensor.
M. Use this option only in daylight harvesting application.
N. Switch shall have option of auto on/off or manual on/auto off operation.
O. Switch shall have led passive infrared sensing indicator.
P. Timer to be set for 15 minutes and switch to be set in manual on/auto off mode at turn on.
Q. Approved venders are Watt Stopper, Hubbell, Novitas, Leviton, or Sensor Switch.

2.6 EXAMINATION

A. Verify equipment is in compliance with approved submittal drawings.

2.7 FIELD MEASUREMENTS (NONE)

2.8 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.
B. Maintain original quality and condition of equipment while it is in storage.

2.9 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Install products in accordance with manufacturer's instructions.
D. Install devices plumb and level.
E. Install switches with off position down.
F. Labeling:

1. Each panel enclosure shall be labeled as to its function.
2. Each bypass switch and bypass relay shall have engraved labels indicating their functions.

G. Installation:

1. Install the work of this section in accordance with manufacturer's printed instructions unless otherwise indicated.

H. Programming:

1. Calibrate settings for time delay, sensitivity, fade rates, etc. to guarantee proper detection of occupants and energy savings. Adjust time delay so that controlled area remains lighted for 5 minutes after occupant leaves area.
2. Set sensor and switching zones as required for application.
3. Set time switch settings as required for application.
4. Provide written or computer-generated documentation on the commissioning of the system including room by room description including:

   a. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
   b. Sequence of operation (e.g. manual ON, Auto OFF, etc.)

5. After 30 days of occupancy, re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

I. Factory Services:

1. Upon completion of the installation, the manufacturer's factory authorized representative shall start up and verify a complete fully functional system.
2. The contractor shall provide both the manufacturer and the electrical engineer with 3 weeks written notice of the system start up and adjustment date.
3. Upon completion of the system start up, the factory-authorized technician shall provide the proper training to the Owner's personnel on the adjustment and maintenance of the system.

2.10 OWNER TRAINING

A. Provide complete operator training for the Owner's personnel.
B. Provide minimum one hour training on the operation of each system in this section.

C. Owner representative shall specifically be shown how the bypass lighting system operates and how he may bypass each of the lighting circuits by operating the bypass switch as part of the control system.

2.1 SPARE EQUIPMENT (NONE)

END OF SECTION 26 09 23

SECTION 26 24 16 – PANELBOARDS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

1. NFPA70 – National Electrical Code.

B. National Electrical Contractors Association (NECA), Standard of Installation, current edition.

C. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.

1. NEMA PB 1 - Panelboards
2. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
3. NEMA AB 1 - Molded Case Circuit Breakers.
4. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)

D. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:

1. UL 50 - Enclosures for Electrical Equipment
2. UL 67 - Panelboards.
3. UL 98 - Enclosed and Dead-front Switches
4. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures

E. Canadian Standards Association (CSA), Specifications and Standards, current edition:

1. CSA Standard C22.2 No. 29-M1989 - Panelboards and Enclosed Panelboards
2. CSA Standard C22.2 No. 5-M91 - Molded Case Circuit Breakers

F. Federal Specifications and standards, current edition:

1. W-P-115C - Type I Class 1
2. W-C-375B - Molded Case Circuit Breakers
3. W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit and Service.
4. W-P115C - Type 1 Class 2 Load Center

G. American Society of Testing Materials (ASTM), Specifications and Standards, current edition.

1.3 DESCRIPTION OF WORK

A. Furnish and install complete and operable Distribution and Branch Circuit Panelboards system as indicated on the drawings and as specified herein.

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to the above:

1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.

2. Overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. Illustrate one line diagrams with applicable voltage systems.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. The panelboard manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.
C. All panelboards provided under this section shall be the products of a single manufacturer specializing in manufacture of panelboard products with a minimum of fifty years documented experience.
D. Provide all necessary accessories required for a complete and operable system.

1.8 WARRANTY

A. Panelboards shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).
B. Provide a complete and fully functional distribution system using materials and equipment of types, sizes, and rating as required to meet performance requirements. Use materials and equipment that comply with referenced standards and manufacturer's standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.

2.2 600VAC POWER DISTRIBUTION PANELBOARDS

A. Manufacturers:

1. Base bid: Square D Company I-LINE – Class 2110
2. Voluntary alternate bid: Cutler-Hammer or equal

B. Interior:

1. Rated 600 vac or 250 VDC maximum. Continuous main current ratings as indicated on drawings not to exceed 1200 amperes maximum. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.
2. UL Listed short circuit current ratings as indicated on the drawings with a maximum of 200,000 RMS symmetrical amperes. Main lug and main breaker panelboards shall be suitable for use as Service Equipment.

3. The panelboard interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
4. The bussing shall be fully rated with sequentially phased branch distribution. Panelboard bussing shall be aluminum. Bus bar plating shall run the entire length of the bus bar. The entire interleaved assembly shall be contained between two U-shaped steel channels, permanently secured to a galvanized steel mounting pan by fasteners.
5. Interior trim shall be of dead-front construction to shield user from all energized parts. Main circuit breakers through 800 amperes shall be vertically mounted. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.
6. A solidly bonded aluminum equipment ground bar shall be provided. An additional aluminum isolated/insulated ground bar shall also be provided where indicated on the drawings.
7. Solid neutral shall be equipped with a full capacity bonding strap for service entrance applications. UL Listed panelboards with 200 percent rated solid neutrals shall have plated aluminum neutral bus for non-linear load applications where indicated on the drawings. Gutter-mounted neutral will not be acceptable.
8. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label, and Short Circuit Current Rating shall be displayed on the interior or in a booklet format. Leveling provisions shall be provided for flush mounted applications.

C. Group mounted circuit breakers through 1200A

1. Circuit breakers shall be group mounted plug-on with mechanical restraint on a common pan or rail assembly.
2. Circuit breakers equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.
3. Line-side circuit breaker connections shall be jaw type.
4. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
5. Electronic trip molded case standard function 80 percent rated circuit breakers:
    a. All electronic circuit breakers shall have the following time/current response adjustments: Long Time Pickup, Long Time Delay, Short Time Pickup, Short Time Delay, Ground Fault Pickup, Ground Fault Delay, and Instantaneous settings. Each adjustment shall have discrete settings (fully adjustable) and shall be independent of all other adjustments.
    b. Circuit breaker trip system shall be a microprocessor-based true RMS sensing designed with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the drawings.
    c. Local visual trip indication for overload, short circuit and ground fault trip occurrences
    d. Long Time Pickup indication to signal when loading approaches or exceeds the adjustable ampere rating of the circuit breaker shall be provided.
    e. Provide for all main circuit breakers.
    f. Provide for branch circuit breakers, 250A frame size and above, where indicated on the drawings.
6. Thermal magnetic molded case circuit breakers
    a. Molded case circuit breakers shall have integral thermal and instantaneous magnetic trip in each pole.
    b. Circuit breakers shall be suitable for the interrupting rating indicated on the drawings.

c. Where true current limiting circuit breakers are indicated on the drawings, manufacturer shall submit one set of published let-through curves (as required by UL) to the owner.
d. Ampere ratings shall be as shown on the drawings.
e. Provide for all branch circuit breakers, unless indicated otherwise on the drawings.

2.3 480VAC LIGHTING AND APPLIANCE PANELBOARDS

A. Manufacturers:

1. Base bid: Square D Company NF - Class 1670
2. Voluntary alternate bid: Cutler-Hammer or equal

B. Interior:

1. Rated 480Y/277 vac maximum. Continuous main current ratings, as indicated on drawings, not to exceed 600 amperes maximum for main breaker panelboards and not to exceed 800 amperes for main lug panelboards.
2. UL Listed short circuit current ratings as indicated on the drawings with a maximum of 200,000 RMS symmetrical amperes.
3. Provide one continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors limited to bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing shall be plated aluminum. Bus bar plating shall run the entire length of the bus bar.
4. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
5. A solidly bonded aluminum equipment ground bar shall be provided. An additional aluminum isolated/insulated ground bar shall also be provided where indicated on the drawings.
6. Split solid neutral shall be plated and located in the mains compartment up to 250 amperes so all incoming neutral cable may be of the same length. UL Listed panelboards with 200 percent rated solid neutrals shall have plated aluminum neutral bus for non-linear load applications where indicated on the drawings.
7. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twist-outs covering unused mounting space.
8. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.
9. Interiors shall be field convertible for top or bottom incoming feed. Main circuit breakers shall be vertically mounted. Sub-feed circuit breakers shall be vertically mounted. Interior leveling provisions shall be provided for flush mounted applications.
10. Interior phase bus shall be pre-drilled to accommodate field installable options such as sub-feed lugs, sub-feed breakers, thru-feed lugs.
11. Interiors shall accept 125 ampere breakers in group mounted branch construction.

C. Main Circuit Breaker:

1. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40 degrees C ambient environment. Thermal elements shall be ambient compensating above 40 degrees C.
2. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.

3. Circuit breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.
4. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position where indicated on the drawings.
5. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 75 degree C rated wire or 90 degree C rated wire as required by the application. Lug body shall be bolted in place; snap-in designs are not acceptable.
6. The circuit breakers shall be UL Listed for use with and provided with the following accessories where indicated on the drawings: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.

D. Branch Circuit Breakers:

1. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the drawings.
2. Molded case branch circuit breakers shall have bolt-on type bus connectors.
3. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.
4. There shall be two forms of visible trip indication. The circuit breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red indicator appearing in the clear window of the circuit breaker housing.
5. The exposed faceplates of all branch circuit breakers shall be flush with one another.
6. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 75 degree C rated wire or 90 degree C rated wire as required by the application.
7. Breakers shall be UL Listed for use with and provided with the following accessories where indicated on the drawings: Shunt Trip, Auxiliary Switch, and Alarm Switch.
8. Circuit breakers shall be UL Listed with the following ratings where indicated on the drawings: (15-125A) Heating, Air Conditioning, and Refrigeration (HACR), (15-30A) High Intensity Discharge (HID), and (15-20A) Switch Duty (SWD)

E. Enclosures:

1. Type 1:
    a. Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvannealed steel will not be acceptable.
    b. Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
    c. Box width shall not exceed 26-inches wide.
    d. Type 1 Fronts:
        1) Front shall meet strength and rigidity requirements per UL 50 standards. Shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
        2) Fronts shall be hinged 1-piece with door. Mounting shall be flush or surface as indicated on the drawings.
        3) Panelboards rated 250 amperes and below shall have fronts with concealed door hinges and trim screws. Front shall not be removable with the door locked. Panelboards rated above 250 amperes shall have vented fronts with concealed door hinges. Doors on front shall have rounded corners; edges shall be free of burrs.

4) Front shall have flat latch type lock with catch and spring loaded stainless steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.

2.4 240VAC LIGHTING AND APPLIANCE PANELBOARDS

A. Manufacturers

1. Base bid: Square D Company QO – Class1630
2. Voluntary alternate bid: Cutler-Hammer or equal

B. Interior:

1. Rated for 240 vac/48 VDC maximum. Continuous main current ratings, as indicated on the drawings, not to exceed 600 amperes maximum.
2. UL Listed short circuit current ratings as indicated on the drawings with a maximum of 200,000 RMS symmetrical amperes.
3. Provide one continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing shall be aluminum. Bus bar plating shall run the entire length of the bus bar. Main lug and main breaker panelboards shall be suitable for use as Service Equipment.
4. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
5. A solidly bonded aluminum equipment ground bar shall be provided. An additional aluminum isolated/insulated ground bar shall also be provided where indicated on the drawings.
6. Split solid neutral shall be plated and located in the mains compartment up to 225 amperes so all incoming neutral cable may be of the same length. UL Listed panelboards with 200 percent rated solid neutrals shall have aluminum neutral bus for non-linear load applications where indicated on the drawings.
7. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twist-outs covering unused mounting space.
8. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.
9. Interiors shall be field convertible for top or bottom incoming feed. Main circuit breakers shall be vertically mounted. Sub-feed circuit breakers shall be vertically mounted. Interior leveling provisions shall be provided for flush mounted applications.

C. Main Circuit Breaker:

1. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40 degrees C ambient environment. Thermal elements shall be ambient compensating above 40 degrees C.
2. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.
3. Circuit breaker handle and faceplate shall indicate rated ampacity. Circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.
4. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position where indicated on the drawings.

5. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 75 degree C rated wire or 90 degree C rated wire as required by the application. Lug body shall be bolted in place; snap-in designs are not acceptable.
6. The circuit breakers shall be UL Listed for use with and provided with the following accessories where indicated on the drawings: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.

D. Branch Circuit Breakers:

1. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the drawings.
2. Molded case branch circuit breakers shall have bolt-on type bus connectors.
3. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.
4. There shall be two forms of visible trip indication. The breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red indicator appearing in the clear window of the circuit breaker housing.
5. The exposed faceplates of all branch circuit breakers shall be flush with one another.
6. Lugs shall be UL Listed to accept solid or stranded copper and aluminum conductors. Lugs shall be suitable for 75 degree C rated wire or 90 degree C rated wire as required by the application.
7. Breakers shall be UL Listed for use with the following accessories where indicated on the drawings: Shunt Trip, Auxiliary Switch, and Alarm Switch.

E. Enclosures:

1. Type 1:

a. Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvannealed steel will not be acceptable.
b. Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
c. Box width shall be 26-inch wide maximum.
d. Type 1 Fronts:

1) Front shall meet strength and rigidity requirements per UL 50 standards. Front shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
2) Fronts shall be hinged 1-piece with door. Mounting shall be flush or surface as indicated on the drawings.
3) Panelboards shall have fronts with concealed door hinges and mounted with trim screws. Front shall not be removable with the door locked. Doors on front shall have rounded corners and edges shall be free of burrs.
4) Front shall have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of door.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify equipment is in compliance with approved submittal drawings.
B. Examine area to receive panelboard to assure adequate clearance for panelboard installation.

C. Start work only after unsatisfactory conditions are corrected.
D. Inspect completed installation for physical damage, anchorage, and grounding.
E. Perform tests according to panelboard manufacturer's instructions.
F. Tighten bus connections and mechanical fasteners.
G. Touch-up scratched or marred surfaces to match original finish.

3.2 FIELD MEASUREMENTS

A. Field verify locations of panelboards with other trades. Adjust as required to meet field conditions and code requirements. Do not base exact panelboard locations on the contract drawings.
B. Identify conflicts with the work of other trades prior to installation of electrical equipment.
C. Adjust panelboard installation to satisfy field requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.
B. Do not store exposed to weather.
C. Physically protect against damage from work of other trades.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

C. Grounding

1. All equipment shall be grounded in accordance with NEC, these specifications and drawings, and the equipment supplier's recommendations.

D. Install panelboards so that circuit breakers are not more than 6 feet above the finished floor or grade.
E. Where panelboards or auxiliary cabinets are flush mounted in an outside wall, insulate the enclosure back and sides with 1/2 inch rigid fiberglass insulation and vapor barrier.
F. Selectively connect branch circuits to equally balance currents in the panelboard busses.
G. See Section 26 05 29 for equipment mounting.
H. Install panelboards plumb and flush with wall finishes.
I. Install panelboards such that top of panel is located at an elevation of 6-feet above finished floor elevation.
J. Provide filler plates for unused spaces in panelboards.
K. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads. See Section 26 05 53.
L. Stub five empty 1-inch conduits to accessible location above ceiling and additional five empty 1-inch conduits below floor (if space exists) of each flush-mounted panelboard to allow for future expansion.
M. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 10 percent, rearrange circuits in the panelboard to balance the phase loads within 10 percent. Take care to maintain proper phasing for multi wire branch circuits.

N. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.
O. Verify that bonding jumper is properly installed in service entrance rated panels.
P. Thoroughly clean and remove construction debris from panelboard interior and exterior.

3.5 OWNER TRAINING

A. Provide complete operator training for the Owner's personnel.
B. Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

3.6 SPARE EQUIPMENT

A. As shown on panel schedules.
B. All spare breakers listed on panel schedules to be mounted in panelboards.

END OF SECTION 26 24 16

SECTION 26 27 26 – WIRING DEVICES

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of ANSI/NFPA 70 - National Electric Code.
B. Conform to current Underwriters Laboratories (UL) Specifications and Standards.
C. Device specific standards and requirements are included in device specifications.

1.3 DESCRIPTION OF WORK

A. Provide and install wiring devices as required on the drawings and as specified herein.

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. All materials, equipment and parts shall be new and unused of current manufacture.
C. Provide all necessary accessories required for a complete and operable system.
D. Store wiring devices and accessories in original cartons and in clean dry space; protect from weather and construction traffic.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 2 years from the date of commissioning against defects in material and workmanship.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 WALL SWITCHES

A. Switches shall be:

1. UL listed for current and voltages indicated.
2. Shall comply with NEMA standard publication WD-1, "Heavy Duty Wiring Devices".

3. Federal Specifications Test WS-896 E.
4. UL standard 20, 943 class A (GFCI) and 498.

B. Switches shall be 20 ampere heavy duty specification grade unless noted.
C. Switches shall have provisions for back and side wiring, screw clamp type suitable for solid or stranded wire with separate green ground screw.
D. Switches shall be ivory unless noted as different by engineer.
E. Switches shall be made of nylon or high impact resistant material.
F. Modular switches with pigtailed terminals are allowed.
G. Supply the following:

1. Wall switch with:

a. 20 ampere, 120/277 volt rating.
b. Toggle handle.
c. Single-pole, double-pole, 3-way and 4-way switches shall be available.
d. Approved vendors are: Cooper, Hubbell Wiring, Leviton, and Pass & Seymour.

2.3 PLATE COVERS

A. All plate covers shall be stainless steel (unless noted as different by engineer) smooth lexan or nylon.
B. Cast metal plates: Die cast profile, ribbed for strength, flash removed, primed with gray enamel, furnished complete with four mounting screws.
C. Steel plates: Hot dip galvanized 1.25 oz /sq. ft. minimum.
D. Surface box plates: Beveled, steel, pressure formed for smooth edge to fit box.
E. Where two-gang boxes are required for single gang devices, provide special plates with device opening in one gang and second gang blank.
F. Approved vendors are: Cooper, Hubbell Wiring, Leviton, and Pass & Seymour.
G. Provide red receptacle plates for EM circuits

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify outlet boxes are installed at proper height.
B. Verify wall openings are neatly cut and will be completely covered by wall plates.
C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
D. Inspect each wiring device for defects.
E. Operate each wall switch with circuit energized and verify proper operation.
F. Verify that each receptacle device is energized.
G. Adjust devices and wall plates to be flush and level.

3.2 FIELD MEASUREMENTS

A. Field verify proper location of all wiring devices with field conditions and adjust accordingly.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.
B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.

2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

B. Install products in accordance with manufacturer's instructions.
C. Install devices plumb and level.
D. Install switches with OFF position down.
E. Install decorative plates on switch, and blank outlets in finished areas.
F. Connect wiring devices by wrapping solid conductor around screw terminal or inserting into wire clamp. Wrapping conductor not allowed for stranded wire.
G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
H. Mount switches at heights shown in specification 26 05 37 unless otherwise noted. Coordinate location with engineer.
I. Preparation:

1. Provide extension rings to bring outlet boxes flush with finished surface.
2. Clean debris from outlet boxes.

3.5 OWNER TRAINING (NONE)

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 27 26

SECTION 26 27 28 – CIRCUIT & MOTOR DISCONNECTS

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. Conform to requirements of current ANSI/NFPA 70 - National Electric Code.
B. Conform to current National Electrical Manufactures Association (NEMA) Standards.
C. Conform to current Underwriters Laboratories (UL) Specifications and Standards.

1.3 DESCRIPTION OF WORK

A. Furnish and install heavy-duty fusible type disconnect switches of types scheduled at locations shown on the drawings and as specified herein.
B. Furnish and install other disconnect switches as necessary and required with proper number of poles, voltage and enclosure type ratings as required for the application and as required by the National Electrical Code.
C. The drawings may or may not indicate disconnects. Disconnects shown on drawings shall be installed for that piece of equipment, even if the disconnect is not required by code.
D. Provide proper environmental enclosure for disconnect depending on the mounting location.
E. Provide fused or non-fused disconnect as required for proper protection of the equipment.
F. Provide all code required disconnects. Assume responsibility for reviewing equipment connections and starting equipment provided with the equipment and determining if disconnects are required.
G. For fused disconnects, provide appropriately sized fuses for the equipment.
H. Install and wire mechanical system starters. See other portions of specifications indicating requirements for work.

1.4 RELATED WORK ELSEWHERE

A. Division 26: Electrical

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. All materials, equipment and parts are to be new, undamaged and unused of current Manufacture.

1.8 WARRANTY

A. Equipment shall be warranted for a period of not less than 1 year from the date of commissioning against defects in material and workmanship.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 DISCONNECTS

A. Disconnect switches shall be heavy duty switch operated type with cover interlock and enclosed arc chamber, quick make and quick break and provision for padlocking in either the open or closed position. All heavy duty, safety switches 30 to 600A, shall be provided with Class R rejection style fuse clips. The combination rating of the heavy-duty switch and R fuse shall be 200,000 symmetrical amps and labeled as such.

B. Approved manufacturers: Base Bid: Square D. Voluntary Alternate Bid: Cutler Hammer, General Electric or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify equipment is in compliance with approved submittal drawings.

3.2 FIELD MEASUREMENTS

A. Field verify locations of disconnects with other trades. Adjust as required to meet field conditions and code requirements.

3.3 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Mount per Section 26 05 29.

B. Cleaning:

1. Prior to turning the system over to the Owner, the system shall be physically cleaned.
2. All appearance defects shall be carefully and professionally touched up so that the equipment is in "factory new" condition.
3. At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

3.5 OWNER TRAINING

A. Provide one hour minimum training on operation and trouble shooting each system in this section.

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 27 28

SECTION 26 32 00 – STANDBY ENGINE/GENERATOR SET

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.

1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

   a. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
   b. NFPA99 – Essential Electrical Systems for Health Care Facilities.
   c. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1-prototype tests required by this standard shall be performed on a complete and functional unit; component level type tests will not substitute for this requirement.

2. Canadian Standards Association (CSA), Specifications and Standards, current edition:

   a. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
   b. CSA 282, 1989 Emergency Electrical Power Supply for Buildings.

3. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:

   a. IEC8528 part 4. Control Systems for Generator Sets.

4. Institute of Electrical and Electronics Engineers, Specifications and Standards, current edition:

   a. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

5. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:

   a. NEMA ICS10-1993 – AC Generator sets.

6. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:

   a. UL2200. The genset shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed.

7. Environmental Protection Agency (EPA) Spark Ignited (SI) New Source Performance Standards (NSPS):

   a. The generator shall be manufacturer certified to meet current emission standards.

1.3 DESCRIPTION OF WORK

A. Furnish and install complete factory assembled generator set equipment with standard analog controls as indicated on the drawings and as specified herein.

B. The generator design was based on the following using a maximum voltage drip of 30%. With the shop drawing submittals the Generator Supplier shall provide the generator sizing calculations illustrating compliance with the load starting requirements identified below.

1. Highest demand of 123 kW of load over the past two year period. The generator is being upsized with capacity for future load expansion.

C. Provide factory test, startup by a supplier authorized by the manufacturer, and on-site testing of the system.

D. The generator set manufacturer shall warrant all equipment provided under this section, whether or not is manufactured by the generator set manufacturer, so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

1.4 RELATED WORK ELSEWHERE

A. For the purpose of obtaining a complete and integrated standby power system, the following sections shall be included under the scope of this section:

1. Section 26 36 00 – Transfer Switch.

B. The following sections include work which is related to the Standby Engine/Generator Set, but which is not included under the scope of this section:

1. Division 26 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. The following information shall be submitted in addition to items listed above:

1. Wiring diagrams indicating wire size and type for each individual piece of equipment.
2. Complete diagrams indicating all equipment and interconnecting components with indication of location of each device.
3. Complete plan, side and elevation view drawings of skid-mounted equipment and exact component layout.
4. All drawings must be in CADD format.
5. Manufacturer certification of prototype testing.
6. Manufacturers published warranty documents.
7. Plan and elevation views with certified overall dimensions, as well as wiring interconnection details.
8. Interconnection wiring diagrams showing all external connections required with field wiring terminals marked in a consistent point-to-point manner.
9. Manufacturer's installation instructions.

1.6 OPERATION & MAINTENANCE MANUALS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.

1.7 FACTORY TESTING

A. The generator set supplier shall perform a complete operational test on the generator set prior to shipping from the factory. Provide a certified test report. Fully test supplied equipment at the factory for function and performance.

B. Factory testing may be witnessed by the Owner and Consulting Engineer. Costs for travel expenses will be the responsibility of the Owner and Consulting Engineer. Supplier is responsible to provide two weeks notice for testing.

C. Perform generator set factory tests on the equipment at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

1.8 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.

B. The following shall be provided in addition to items listed above.

1. Arrange pre-installation meeting.
2. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
3. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
4. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
5. Manufacturer must carry replacement parts.

C. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

D. All materials, equipment, and parts shall be new and unused of current manufacture.

E. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

F. The Standby Engine/Generator Set manufacturer shall have been engaged in the manufacture of generator sets for a minimum of ten years and shall have a factory trained service and parts organization located within 100 miles of the jobsite.

G. All control equipment shall be the standard product of the engine/generator set manufacturer. Controls systems supplied by a subcontractor of the manufacturer and not incorporated into the standard documentation of the manufacturer will not be acceptable.

1.9 WARRANTY

A. The generator set and associated equipment shall be warranted for a period of not less than 5 years from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The manufacturer of the generator set shall maintain service parts inventory at a central location that is accessible to the service location 24 hours per day, 365 days per year.

D. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

E. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

F. The warranty shall not derive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).

2.2 MANUFACTURER

A. Acceptable Manufacturers

1. Kohler Power Systems no equal.

B. These specifications, installation design, the heating/ventilation design, and the fuel system design are based upon the first named manufacturer. If the contractor elects to supply a different manufacturer, then the contractor shall be responsible for adjusting the installation of the standby engine/generator set to satisfy the requirements of that manufacturers equipment.

C. Alternate equipment to the named manufacturers will only be considered if the following information is submitted ten days prior to the bid date:

1. Certified dimensional data.
2. Verification of adequate cooling/combustion air for the installation.
3. Complete interconnecting wiring and piping diagrams.
4. Manufacturer's certification of prototype testing.
5. Load study/profile showing non-overloading of genset under steady-state conditions and during motor starting.
6. Manufacturer's product literature and performance data, sufficient to verify compliance to specification requirements.
7. A paragraph-by-paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
8. Short circuit study of the load circuits to verify that selective coordination occurs and that thermal-magnetic stresses on components will not exceed the specified ratings.
9. Listing of similar projects and owner contact information for projects completed during the previous five years.

2.3 GENERATOR SET

A. Ratings

1. The generator set shall operate at 1800 rpm and at a voltage of: 277/480 Volts AC, Three-phase, Four-wire, 60 hertz. .
2. The generator set shall be rated at 200kW, 250 kVA at 0.8 PF, standby rating, based on site conditions of: Altitude 1000 feet, ambient temperatures up to 100 degrees F.
3. The generator set rating shall be based on emergency/standby service.

B. Performance

1. Voltage regulation shall be plus or minus 1.0 percent for any constant load between no load and rated load for both parallel and non-parallel applications. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5 percent.
2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.
3. The engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
4. The generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified kVA load at near zero power factor applied to the generator set.
5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic. Telephone influence factor shall be less than 40.

C. Construction

1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a corrosion resistant battery tray with hold-down clamps within the rails.

D. Connections

1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations for the number and type cables shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.
2. Power connections to auxiliary devices shall be made at the devices, with required protection located at the power distribution panel as shown on the drawings.
3. Generator set control interfaces to other system components shall be made on a common, permanently labeled terminal block assembly.

2.4 ENGINE AND ENGINE EQUIPMENT

A. The engine shall natural gas fueled, radiator and fan cooled. Minimum displacement shall be 632 cubic inches, with V-8 cylinders. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories.

B. Engine accessories and features shall include:

1. Complete engine fuel system, including all pressure regulators, strainers, and control valves. The fuel system shall be plumbed to the generator set skid for ease of site connections to the generator set.
2. An electronic governor system shall provide automatic isochronous frequency regulation.
3. Electric starter(s) capable of three complete cranking cycles without overheating.
4. Positive displacement, mechanical, full pressure, lubrication oil pump.
5. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
6. Replaceable dry element air cleaner with restriction indicator.
7. Flexible fuel lines.
8. Engine mounted battery charging alternator, 40-ampere minimum, and solid-state voltage regulator.
9. Coolant heater:

    a. Engine mounted thermostatically controlled, coolant heater for each engine. Heater voltage shall be as shown on the project drawings. The coolant heater shall be UL499 listed and labeled.
    b. The coolant heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12 inches. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heater shall be installed using quick disconnect couplers to isolate the heater for replacement of the heater element. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.
    c. The coolant heater shall be provided with a 12VDC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system.
    d. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 100F (40C) in a 40F ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.

10. Provide vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.
11. Starting and Control Batteries shall be calcium/lead antimony type, 12 volt DC, sized as recommended by the engine manufacturer, complete with battery cables, connectors, and corrosion resistant battery tray.

2.5 AC GENERATOR

A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single pre-lubricated sealed bearing, air-cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 125 degrees Centigrade.

B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single-phase or three-phase fault at approximately 300% of rated current for not more than 10 seconds.

D. The sub-transient reactance of the alternator shall not exceed 12 percent, based on the standby rating of the generator set.

2.6 EMERGENCY STOP BUTTON

A. Provide a remote emergency stop button as shown on the drawings.

2.7 ENGINE GENERATOR SET CONTROL

A. A NEMA 1 enclosed control panel shall be mounted on the generator set with vibration isolators. The control shall be vibration isolated and prototype tested to verify the durability of all components under the vibration conditions encountered.

B. The generator set mounted control shall include the following features and functions:

1. Three-position control switch labeled RUN/OFF/AUTO. In the RUN position the generator set shall automatically start, and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
2. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
3. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power.
4. Generator Set AC Output Metering: The generator set shall be provided with a metering set with the following features and functions:

    a. Analog AC Voltmeter, dual range, 90 degree scale, 2% accuracy; Analog AC Ammeter, dual range, 90 degree scale, 2% accuracy; Analog Frequency/RPM meter, 45-65 Hz, 1350-1950 RPM, 90 degree scale, +/- 0.6 Hz accuracy.
    b. Seven position phase selector switch with OFF position to allow meter display of current and voltage in each generator phase. When supplied with re-connectable generators, the meter panel shall be re-connectable for the voltage specified.

5. Generator Set Alarm and Status Display: The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and existing alarm and shutdown conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on the display panel:

    a. Low oil pressure (alarm).
    b. Low oil pressure (shutdown).
    c. Low coolant temperature (alarm).
    d. High coolant temperature (alarm).
    e. High coolant temperature (shutdown).

f. Over-crank (shutdown).
g. Over-speed (shutdown).
h. Low fuel (alarm).
i. In addition, provisions shall be made for indication of two customer-specified alarm or shutdown conditions.

6. Engine Status Monitoring: The following devices shall be provided on the generator set control:

a. Engine oil pressure gauge.
b. Engine coolant temperature gauge.
c. Engine operation hour gauge.
d. Battery voltage (DC volts).

7. Engine Control Functions. The control system provided shall include a cycle cranking system, which shall be for 3 cranking periods of 15 seconds each, with 15 second rest period between cranking periods. Fail to start shall be indicated by operation of the over-crank alarm indication lamp. The control system shall also include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification.

8. Alternator Control Functions:

a. The generator set shall include an automatic voltage regulation system that is matched and prototype tested with the governing system provided. It shall be immune from mis-operation due to load-induced voltage waveform distortion and provide a pulse-width modulated output to the alternator exciter. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of [58-59] HZ.
b. Voltage adjusting rheostat, locking screwdriver type, to adjust voltage +/- 5% from rated value.

9. Control Interfaces for Remote Monitoring. Provide the following features in the control system:

a. Form "C" dry common alarm contact set rated 2A @ 30VDC to indicate existence of any alarm or shutdown condition on the generator set.
b. One set of contacts rated 2A @ 30VDC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90% of rated condition.
c. A fused 10-amp switched 12VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.
d. A fused 20-amp 12VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.

10. Provide and install a 20-light LED type remote alarm annunciator with horn, located as shown on the drawings or in a location that can be conveniently monitored by facility personnel. The remote annunciator shall provide all the audible and visual alarms called for by NFPA Standard 110 for level 1 systems; and in addition shall provide indications for high battery voltage, low battery voltage, loss of normal power to the charger. Spare lamps shall be provided to allow future addition of other alarm and status functions to the annunciator. Provisions for labeling of the annunciator in a fashion consistent with the specified functions shall be provided. Alarm silence and lamp test switch (es) shall be provided. LED lamps shall be replaceable, and indicating lamp color shall be capable of changes needed for specific application requirements. Alarm horn shall be switchable for all annunciation points. Alarm horn (when switched on) shall sound for first fault, and all subsequent faults, regardless of whether first fault has been cleared, in compliance with NFPA110 3-5.6.2. Annunciator shall be powered by generator battery.

11. The generator set shall be provided with a mounted main line circuit breaker, sized to carry the rated output current of the generator set on a continuous basis as shown on the drawings. Circuit breaker shall be equipped with shunt trip and shall automatically open on a genset shutdown alarm.
12. The generator set shall be provided with two mounted main line circuit breakers sized to carry the rated output. Current of the generator set on a continuous basis as shown on the drawings. Circuit breakers shall be equipped with shunt trip and shall automatically open on a genset shutdown alarm.

C. Sequence of Operation

1. Generator set shall start on receipt of a start signal from remote equipment.
2. The generator set control shall initiate the starting sequence for the generator set.
3. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.
4. When all start signals have been removed from the generator set, the generator set control shall switch off the excitation system and shall shut down.
5. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

2.8 ENGINE EXHAUST SYSTEM

A. Provide exhaust silencer(s) for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. The mufflers shall be critical grade. Exhaust system shall be installed according to the engine manufacturer's recommendations and applicable codes and standards.
B. Provide stainless steel, seamless flexible exhaust manifold connector.
C. Silencer and exhaust piping shall be insulated with rigid insulation to maintain a surface temperature of not more than 150 degrees F. Provide 0.016-inch aluminum jacket complete with crimped end covers, secured with stainless steel sheet metal screws and rubber coated washers. Insulation system shall not interfere with flexible fittings.
D. Provide exhaust thimble(s) for exhaust penetration of exterior walls. Construction shall be fireproof.

2.9 NATURAL GAS ENGINE FUEL SYSTEM

A. The mechanical contractor shall provide fuel-piping system.
B. Provide appropriately sized fuel regulator.
C. Engine fuel consumption shall not exceed 2398 cfh at a pressure of 7-11 inches of water column.

2.10 OUTDOOR WEATHER-PROTECTIVE SOUND ATTENUATING HOUSING

A. The generator set shall be provided with a sound-attenuated housing which allows the generator set to operate at full rated load in the ambient conditions previously specified. The enclosure shall reduce the sound pressure level of the generator set while operating at full rated load to a maximum of 70 dBA at any location 7 meters from the generator set in a free field environment. Housing configuration and materials used may be of any suitable design which meets application needs, except that acoustical materials used shall be oil and water resistant. No foam materials shall be used unless they can be demonstrated to have the same durability and life as fiberglass.
B. The enclosure shall include hinged doors for access to both sides of the engine and alternator, and the control equipment. Key-locking and pad-lockable door latches shall be provided for all doors. Door hinges shall be stainless steel.
C. The enclosure shall be provided with an exhaust silencer that is mounted inside of the enclosure, and allows the generator set package to meet specified sound level requirements. Silencer and exhaust shall include a rain cap and rain shield.
D. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color. All surfaces of all metal parts shall be primed and painted.

E. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.

F. Louvers shall be provided for cooling-air inlet and discharge. They shall be stormproof and drainable to prevent entry of rain and snow. The louvers shall be automatic for the cooling-air inlet and discharge. The dampers shall be closed to reduce enclosure heat loss and maintain 40 degree Fahrenheit in the enclosure in cold weather when the unit is not operating. Provide 120-volt, 20-amp circuit for these louvers.

2.11 ACCESSORIES

A. Provide supply of consumables (air cleaner, oil filter, etc) in sufficient quantity to last for one year from the date of substantial completion.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Contractor shall have overall system responsibility and shall provide all materials and labor necessary provide a complete and operable system and comply with all requirements of this section.

B. The engine/generator set manufacturer shall be responsible for certifying the correctness of installation for all work related to the standby power system regardless of who performs the installation work.

C. The contract drawings are diagrammatic in nature; it shall be the responsibility of the manufacturer to supplement the contract drawings and complete the final design of the standby power system and to coordinate exact requirements with the installing contractors.

3.2 FIELD MEASUREMENTS

A. Field verify with exact measurements, the available mounting space for standby power system equipment. Identify deficiencies prior to beginning installation.

3.3 DELIVERY STORAGE AND HANDLING

A. It shall be the responsibility of the installing contractor to receive all standby power system equipment at the job site. Carefully inspect all equipment for damage prior to accepting from the shipping agency. Do not accept shipment if damage is evident.

B. The Contractor shall exercise due diligence in storing, protecting, and moving standby power system equipment. Damaged or worn equipment will not be accepted and will be replaced at no additional cost to the Owner.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment, and written notice received from Architect stating that these conditions exist at building site.

B. Install equipment in locations as indicated on the contract documents. Adjust locations as needed to ensure operability, serviceability, and compliance with all applicable codes and standards.

C. Installation shall be completely tested prior to start-up. This work includes verification of all field wiring continuity and proper termination of wiring.

D. The Contractor shall install the equipment by in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

E. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The Contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

F. Equipment shall be installed on concrete housekeeping pads. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.

G. Equipment shall be initially started and operated by representatives of the manufacturer.

H. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to final testing of the system.

I. Provide 8" concrete pad between floor and generator skid.

3.5 TESTING AND START-UP SERVICES

A. Standby power system supplier shall provide installation and start-up services required to place the complete system into operation. Installation service shall include a preliminary visit to assist with and verify correct mechanical and electrical installations. Start-up service shall include checkout within one month of commissioning for the purpose of verifying correct operation of the generator set's individual systems, and for making any necessary final adjustments and corrections.

B. The complete installation shall be tested for compliance with the specification following completion of all site work. Representatives of the manufacturer shall conduct testing, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.

C. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two-hour full load test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test. Provide all required cables and make accommodations for routing of cables to allow load bank to be located outside of the building.

D. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel. Verify correct genset operation with transfer switch programmed transition functionality per 26 36 00.

E. Test alarm and shutdown circuits by simulating conditions. Adjust output voltage and engine speed.

F. Record kW, Amps, Volts, Frequency, oil pressure, coolant temperature, and room temperature at twenty-minute intervals during the test and report findings to Engineer in writing.

G. Verify operation of room ventilation system including interlocks with generator equipment.

H. Verify fuel system installation and capacity.

3.6 OWNER TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to five persons. Training date shall be coordinated with the facility Owner.

B. Describe the loads connected to the standby power system along with restrictions for future use. Coordinate this discussion with the process instrumentation control system integrator to include automatic step start control and load control.

3.7 SPARE EQUIPMENT (NONE)

END OF SECTION 26 32 00

SECTION 26 36 00 – GENERATOR TRANSFER SWITCH

PART 1 - GENERAL

1.1 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions, apply to work of this section.

1.2 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.

1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:

   a. NFPA20 – Fire Pumps. Transfer switches serving fire pumps shall be specifically listed and labeled for that application.
   b. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
   c. NFPA99 – Essential Electrical Systems for Health Care Facilities.
   d. NFPA110 – Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems.

2. Canadian Standards Association (CSA), Specifications and Standards, current edition:

   a. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
   b. CSA 282, 1989 Emergency Electrical Power Supply for Buildings.

3. European Committee for Electrotechnical Standardization (CENELEC), Specifications and Standards, current edition:

   a. EN55011, Class B Radiated Emissions.
   b. EN55011, Class B Conducted Emissions.

4. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:

   a. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity.
   b. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity.
   c. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity.
   d. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity. Similar waveforms are described in ANSI/IEEE 62.41-1991.
   e. IEC 1000-4-6 Conducted Field Immunity.
   f. IEC 1000-4-11 Voltage Dip Immunity.

5. Institute of Electrical and Electronics Engineers, Specifications and Standards, current edition:

   a. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:

   a. NEMA ICS10-1993 – AC Automatic Transfer Switches.

7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:

   a. UL1008. The transfer switch shall be UL listed and labeled.

1.3 DESCRIPTION OF WORK

A. Provide complete factory assembled power transfer equipment with field programmable digital electronic controls designed for fully automatic operation and including: surge voltage isolation, voltage sensors on all phases of both sources, linear operator, permanently attached manual handles, positive mechanical and electrical interlocking, and mechanically held contacts for both sources.

B. Provide factory test, startup by a supplier authorized by the manufacturer, and on-site testing of the system. Technicians specifically trained to support the product and employed by the generator set supplier shall service the transfer switches.

C. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for all the products provided.

D. The automatic transfer switch specified herein shall be equipped with a time delay in the neutral position (programmed transition). Alternative methods for transfer control are not acceptable.

E. The Contractor shall have overall system responsibility and shall provide all materials and labor necessary provide a complete and operable system and comply with all requirements of this section.

F. The engine/generator set manufacturer shall be responsible for certifying the correctness of installation for all work related to the standby power system regardless of who performs the installation work.

G. The contract drawings are diagrammatic in nature; it shall be the responsibility of the manufacturer to supplement the contract drawings and complete the final design of the standby power system and to coordinate exact requirements with the installing contractors.

1.4 RELATED WORK ELSEWHERE

A. For the purpose of obtaining a complete and integrated standby power system, the following sections shall be included under the scope of this section:

1. Section 26 32 00 – Standby Engine/Generator Set.

B. The following sections include work which is related to the Standby Engine/Generator Set, but which is not included under the scope of this section:

1. Division 26 – Electrical.

1.5 SHOP DRAWINGS

A. Submit shop drawings in accordance with Section 26 05 04.

B. General requirements specific to this section include:

1. Submit complete and integrated document containing all equipment included under the scope of this section as part of the submittal document for the Standby Engine/Generator Set.
2. Submittal shall be complete, neat, orderly, and indexed with tabbed dividers. Partial submittals will not be accepted.
3. Clarity and completeness are of prime importance. Acceptability of submittal drawings shall be at the sole discretion of the Engineer in regards to this requirement.
4. Additional requirements for the various subsystems are specified in the corresponding sections.

C. Submit the following information:

1. Manufacturer's product literature and performance data, sufficient to verify compliance to specification requirements.
2. A paragraph-by-paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
3. Manufacturers published warranty documents.
4. Shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.
5. Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
6. Manufacturer's installation instructions.

1.6 OPERATION & MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit Operations & Maintenance Manuals in accordance with Section 26 05 04.
B. Submit final revised shop drawings incorporating any modifications made as a result of installation, start-up, operational testing, or for any other cause. Submit results of all field-testing and corrective actions taken for all operational parameters.
C. Submit manufacturer's standard operation & maintenance information including installation manuals and safety instructions.
D. Submit contact list identifying names, addresses, telephone numbers, and any additional contact information for each equipment service organization involved with the Standby Engine/Generator Set.
E. Submit detailed operation and maintenance procedures for each major equipment item; include description of operation for all modes of operation, routine maintenance procedures, and trouble-shooting guide.
F. Submit listing of spare parts provided under this contract and of recommended additional spare parts not provided under this contract along with costs.

1.7 QUALITY ASSURANCE

A. Provide quality assurance in accordance with Section 26 05 04.
B. The Automatic Transfer Switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.
C. All materials, equipment, and parts shall be new and unused of current manufacture.
D. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.
E. The Automatic Transfer Switch manufacturer shall have been engaged in the manufacture of generator sets for a minimum of ten years and shall have a factory trained service and parts organization located within 100 miles of the jobsite.
F. All control equipment shall be the standard product of the engine/generator set manufacturer. Controls systems that are supplied by a subcontractor of the manufacturer and which are not incorporated into the standard documentation of the manufacturer will not be acceptable.

1.8 WARRANTY

A. The automatic transfer switch and associated equipment shall be warranted for a period of not less than five years from the date of commissioning against defects in materials and workmanship.
B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.
C. The manufacturer of the transfer switch shall maintain service parts inventory at a central location that is accessible to the service location twenty-four hours per day, three hundred sixty-five days per year.
D. The automatic transfer switch shall be serviced by a local service organization that is trained and factory certified in automatic transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call twenty-four hours per day, three hundred sixty-five days per year.
E. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least twenty years.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials and equipment furnished shall be current production of manufacturers regularly engaged in the manufacture of such items, and for which replacement parts are available. All materials and equipment shall be new (less than 1 year old when turned over to the Owner).
B. Acceptable Manufacturers:

1. Kohler Power Systems no equal.

C. The automatic transfer switch shall be provided as part of a complete, integrated standby power system. As such, the manufacturer of the Standby Engine/Generator Set shall provide it.

2.2 POWER TRANSFER SWITCH

A. Ratings

1. Refer to the project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, number of poles, voltage and ampere ratings, enclosure type, and accessories.
2. Main contacts shall be rated for 600 Volts AC, minimum.
3. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C, relative humidity up to 95 percent (non-condensing), and altitudes up to 10,000 feet (3000M).
4. Transfer switch equipment shall have withstand and closing ratings (WCR) in RMS symmetrical amperes greater than the available fault currents shown on the drawings and at the specified voltage. The transfer switch and its upstream protection shall be coordinated. The transfer switch shall be third party listed and labeled for use with the specific protective device(s) installed in the application.

B. Construction

1. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the source 1 and source 2 positions. The transfer switch shall be specifically designed to transfer to the best available source if it inadvertently stops in a neutral position.
2. Transfer switches rated through 1000 amperes shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms. Transfer switches over 1000 amperes shall be equipped with manual operators for service use only under de-energized conditions.
3. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
4. Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.
5. Power transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.
6. Transfer switches designated as 3-pole switches on the drawings shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100 percent of the current designated on the switch rating.

C. Connections

1. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
2. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the drawings.

2.3 TRANSFER SWITCH CONTROL

A. Operator Panel. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The operator panel shall be a sealed membrane panel rated NEMA 3R/IP53 or better (regardless of enclosure rating) that is permanently labeled for switch and control functions.

B. Operator panel and features and capabilities shall include:

1. High intensity LED lamps to indicate the source that the load is connected to (source 1 or source 2); and which source(s) are available. Source available LED indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control.
2. High intensity LED lamps to indicate that the transfer switch is "not in auto" (due to control being disabled or due to bypass switch (when used) enabled or in operation) and "Test/Exercise Active" to indicate that the control system is testing or exercising the generator set.
3. "OVERRIDE" pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and retransfer and immediately proceed with its next logical operation.
4. "TEST" pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.
5. "RESET/LAMP TEST" pushbutton that will clear any faults present in the control, or simultaneously test all lamps on the panel by lighting them.
6. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via a PC-based service tool or an operator display panel.

C. Internal Controls

1. The transfer switch control system shall be field-configurable for any operating voltage level up to 600VAC. Provide RMS voltage sensing and metering that is accurate to within +/-1 percent of nominal voltage level. Frequency sensing shall be accurate to within +/-0.2 percent. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field-configurable are not acceptable.
2. Transfer switch voltage sensors shall be close differential type, providing source availability information to the control system based on the following functions:
   a. Monitoring all phases of the normal service (source 1) for under voltage conditions (adjustable for pickup in a range of 85 to 98 percent of the normal voltage level and dropout in a range of 75 to 98 percent of normal voltage level).
   b. Monitoring all phases of the emergency service (source 2) for under voltage conditions (adjustable for pickup in a range of 85 to 98 percent of the normal voltage level and dropout in a range of 75 to 98 percent of pickup voltage level).
3. All transfer switch sensing shall be configurable from a Windows 95, 98, 2000, or NT PC-based service tool, to allow setting of levels, and enabling or disabling of features and functions. Selected functions including voltage sensing levels and time delays shall be configurable using the operator panel. Designs utilizing DIP switches or other electromechanical devices are not acceptable. The transfer control shall incorporate a series of diagnostic LED lamps.
4. The transfer switch shall be configurable to control the operation time from source to source (program transition operation). The control system shall be capable of enabling or disabling this feature, and adjusting the time period to a specific value. A phase band monitor or similar device is not an acceptable alternate for this feature.
5. The transfer switch shall incorporate adjustable time delays for generator set start (adjustable in a range from 0-15 seconds); transfer (adjustable in a range from 0-120 seconds); retransfer (adjustable in a range from 0-30 minutes); and generator stop (cool down) (adjustable in a range of 0-30 minutes).
6. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.
7. The control system shall be designed and prototype tested for operation in ambient temperatures from -40C to +70C. It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.

8. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

D. Battery Charger

1. The transfer switch shall be provided with a battery charger for the generator set starting batteries. The battery charger shall be a float type charger rated 2 amps. The battery charger shall include an ammeter for display of charging current and shall have fused AC inputs and DC outputs.
2. Provide the transfer switch with a battery charger for the generator set starting batteries. The battery charger shall be a float type charger rated 6 amps minimum. The battery charger shall include an ammeter for display of charging current and shall have fused AC inputs and DC outputs. The charger shall also include fault indications for high and low dc voltage, and supply power failed, and dry contacts for external indication of these fault conditions. Display supply power failed indication on the ATS control panel.

E. Control Interface

1. The transfer switch will provide an isolated relay contact for starting of a generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C, for compatibility with any generator set.
2. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.

F. Non-Automatic Switches

1. Transfer switches designated on the drawings as Non-Automatic shall be provided with a control capable of operating the transfer switch either by a remote contact opening or closing or by a front panel mounted selector switch. The selector switch shall be a three-position switch. In the center Auto position the transfer switch shall transfer and retransfer in response to input signals from the automatic transfer switch. The key shall be removable with the selector switch in the Auto position only. Turning the selector switch to the Emergency position shall transfer load to an energized emergency power source. Turning the selector switch to the Normal position shall transfer load to an energized normal power source.

2.4 ENCLOSURE

A. Enclosures shall be UL listed. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70. The cabinet door shall include permanently mounted key type latches.

B. Transfer switch equipment shall be provided in a NEMA 1 or better enclosure.

C. Enclosures shall be the NEMA type specified. The cabinet shall provide code-required wire bend space at point of entry as shown on the drawings. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or non-key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.

2.5 OPERATION

A. Sequence of Operation

1. Transfer switch normally connects an energized utility power source (source 1) to loads and a generator set (source 2) to the loads when normal source fails. The normal position of the transfer switch is source 1 (connected to the utility), and no start signal is supplied to the genset.
2. Generator Set Exercise (Test) With Load Mode. The control system shall be configurable to test the generator set under load. In this mode, the transfer switch shall control the generator set in the following sequence:

a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
b. The transfer switch shall issue a compatible start command to the generator set.
c. When the control systems senses the generator set at rated voltage and frequency, it shall operate to connect the loads to the generator set by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.
d. The generator set shall operate connected to the load for the duration of the exercise period. If the generator set fails during this period, the transfer switch shall automatically reconnect the generator set to the normal service.
e. On completion of the exercise period, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.
f. The transfer switch shall operate the generator set unloaded for a cool down period, and then remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

3. Generator Set Exercise (Test) Without Load Mode. The control system shall be configurable to test the generator set without transfer switch load connected. In this mode, the transfer switch shall control the generator set in the following sequence:

a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
b. The transfer switch shall issue a compatible start command to the generator set.
c. When the control systems senses the generator set at rated voltage and frequency, it shall operate the generator set unloaded for the duration of the exercise period.
d. At the completion of the exercise period, the transfer switch shall remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify surfaces and areas are ready to receive work.
B. Verify field measurements are accurate and shown on drawings.
C. Verify proper power connections are installed.
D. Proceed with installation only after unsatisfactory conditions are corrected.
E. All wiring shall test free from grounds and shorts.

3.2 FIELD MEASUREMENTS

A. Field verify with exact measurements, the available mounting space for standby power system equipment. Identify deficiencies prior to beginning installation.

3.3 DELIVERY STORAGE AND HANDLING

A. It shall be the responsibility of the installing contractor to receive all standby power system equipment at the job site. Carefully inspect all equipment for damage prior to accepting from the shipping agency. Do not accept shipment if damage is evident.
B. Exercise due diligence in storing, protecting, and moving standby power system equipment. Damaged or worn equipment will not be accepted and will be replaced at no additional cost to the Owner.

3.4 INSTALLATION

A. General:

1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
3. Start of installation shall not begin until areas are broom clean, properly lighted, exterior enclosing walls in place, exterior windows glazed, roof completely installed to prevent weather damage to equipment.

B. Install equipment in locations as indicated on the contract documents. Adjust locations as needed to ensure operability, serviceability, and compliance with all applicable codes and standards.

C. Mount per Section 26 05 29.

D. Installation shall be completely tested prior to start-up. This work includes verification of all field wiring continuity and proper termination of wiring.

E. The contractor shall install the equipment in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

F. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

G. Equipment shall be initially started and operated by representatives of the manufacturer.

H. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to final testing of the system.

I. Final Testing:

1. Standby power system supplier shall provide installation and start-up services required to place the complete system into operation.
2. The complete installation shall be tested for compliance with the specification following completion of all site work. Representatives of the manufacturer shall conduct testing, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.
3. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two-hour full load test, and a one-step rated load pickup test in accordance with NFPA 110.
4. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.
5. Test all control functions by simulating conditions.
6. The generator set supplier shall perform a complete operational test on the automatic transfer switch prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.
7. Factory testing may be witnessed by the owner and consulting engineer. Costs for travel expenses will be the responsibility of the owner and consulting engineer. Supplier is responsible to provide two weeks notice for testing.
8. Test process shall include calibration of voltage sensors.
9. One technician follow-up visit shall be scheduled one month after commissioning for the purpose of verifying satisfactory system operation and making any required final adjustments and repairs.

3.5 OWNER TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided as part of the owner training session specified under Standby Engine Generator Set.
B. Provide complete operator training for the Owner's personnel.
C. Provide two (2) four hour training sessions on consecutive days at times set by the Owner. These should be scheduled as part of the Owner's pre-occupancy transition training.
D. Use submitted Operations & Maintenance manuals as reference during this demonstration and tour.

3.6 SPARE EQUIPMENT (NONE)

END OF SECTION 26 36 00

CITY OF SHEBOYGAN

REQUEST FOR PUBLIC WORKS COMMITTEE CONSIDERATION

ITEM DESCRIPTION: An ordinance creating parking limits so as to add a two-hour parking limit – between 8:00 am and 6:00 p.m., except Sundays and holidays – on a portion of the south side of Union Avenue between S. 14th Street and Henry Street.

REPORT PREPARED BY: Ryan Sazama, City Engineer

REPORT DATE: December 9, 2021 **MEETING DATE:** December 14, 2021

FISCAL SUMMARY:

Budget Line Item:	N/A
Budget Summary:	N/A
Budgeted Expenditure:	N/A
Budgeted Revenue:	N/A

STATUTORY REFERENCE:

Wisconsin Statutes:	N/A
Municipal Code:	N/A

BACKGROUND / ANALYSIS: A new business recently moved to an existing unoccupied commercial building located at 1327 Union Avenue. The new business owner inquired about a 2-hour parking limit Monday through Saturday (similar to other businesses on Union Avenue) at the main entrance to their building for ease of access for customers.

STAFF COMMENTS: City staff supports granting the proposed time limit parking spot on Union avenue so as to assist the newly opened business.

ACTION REQUESTED: Motion to recommend the Common Council adopt G.O. No. 30-21-22 creating parking limits so as to add a two-hour parking limit – between 8:00 am and 6:00 p.m., except Sundays and holidays – on a portion of the south side of Union Avenue between S. 14th Street and Henry Street.

ATTACHMENTS:

I. G.O. No. 30-21-22

X

6.1

Gen. Ord. No. 30 - 21 - 22. By Alderpersons Dekker and Perrella.
December 6, 2021.

AN ORDINANCE creating parking limits so as to add a two-hour parking limit - between 8:00 a.m. and 6:00 p.m., except Sundays and holidays - on a portion of the south side of Union Avenue between S. 14th Street and Henry Street.

THE COMMON COUNCIL OF THE CITY OF SHEBOYGAN DO ORDAIN AS FOLLOWS:

Section 1. Pursuant to Section 118-126 of the Municipal Code entitled "Prohibitions and Restrictions Authorized," parking on the south side of Union Avenue from 48 feet east of the east curb line of S. 14th Street to the east curb line of S. 14th Street shall be limited to two hours between 8:00 a.m. to 6:00 p.m., except Sundays and holidays.

Section 2. The Department of Public Works and the Police Department are hereby authorized and directed to install the signs to give notification of the aforementioned parking restriction.

Section 3. All ordinances or parts thereof in conflict with the provisions of this ordinance are hereby repealed to the extent of such conflict, and this ordinance shall be in effect from and after its passage and publication.

Dean Dekker

Gaston Perrella

PW

I HEREBY CERTIFY that the foregoing Ordinance was duly passed by the Common Council of the City of Sheboygan, Wisconsin, on the _____ day of _____, 20____.

Dated_____ 20____. _____, City Clerk

Approved_____ 20____. _____, Mayor

X

6.2

Gen. Ord. No. 31 - 21 - 22. By Alderpersons Dekker and Perrella.
December 6, 2021.

AN ORDINANCE creating a no parking zone on the north side of Union Avenue west of S. 25th Street.

THE COMMON COUNCIL OF THE CITY OF SHEBOYGAN DO ORDAIN AS FOLLOWS:

Section 1. Pursuant to Section 118-126 of the Municipal Code entitled "Prohibitions and Restrictions Authorized," the north side of Union Avenue from 30 feet west of the west curb line of S. 25th Street to the west curb line of S. 25th Street is hereby added to the list of locations where parking is not permitted.

Section 2. The Department of Public Works and the Police Department are hereby authorized and directed to install the signs to give notification of the aforementioned parking restriction.

Section 3. All ordinances or parts thereof in conflict with the provisions of this ordinance are hereby repealed to the extent of such conflict, and this ordinance shall be in effect from and after its passage and publication.

PW

Dan Dekker

Jason Perrella

I HEREBY CERTIFY that the foregoing Ordinance was duly passed by the Common Council of the City of Sheboygan, Wisconsin, on the _____ day of _____, 20____.

Dated_____ 20____. _____, City Clerk

Approved_____ 20____. _____, Mayor

CITY OF SHEBOYGAN

REQUEST FOR PUBLIC WORKS COMMITTEE CONSIDERATION

ITEM DESCRIPTION: An ordinance creating a no parking zone on the north side of Union Avenue west of S. 25th Street.

REPORT PREPARED BY: Ryan Sazama, City Engineer

REPORT DATE: December 9, 2021 **MEETING DATE:** December 14, 2021

FISCAL SUMMARY:		**STATUTORY REFERENCE:**	
Budget Line Item:	N/A	Wisconsin Statutes:	N/A
Budget Summary:	N/A		
Budgeted Expenditure:	N/A	Municipal Code:	N/A
Budgeted Revenue:	N/A		

BACKGROUND / ANALYSIS: Due to sight distance issues when exiting S. 25th Street onto Union Avenue several residences have requested that one parking spot along Union Avenue (north side of road) be eliminated to help increase the sight distance for safety reasons. The reason for the vehicles parking too close to the intersection and creating this issue is due to there is no crosswalk installed for north to south pedestrian traffic at this intersection. A north/south crosswalk was never installed at this location because it would lead into driveway which is not permitted.

STAFF COMMENTS: Due to the safety reasons stated above City staff supports the request.

ACTION REQUESTED: Motion to recommend the Common Council adopt G.O. No. 31-21-22 creating a no parking zone on the north side of Union Avenue west of S. 25th Street.

ATTACHMENTS:

I. G.O. No. 31-21-22

X

6.3

Gen. Ord. No. 32- 21 - 22. By Alderpersons Dekker and Perrella.
December 6, 2021.

AN ORDINANCE creating three no parking zones in the vicinity of Greenfield Ave. and S. 9th Street.

THE COMMON COUNCIL OF THE CITY OF SHEBOYGAN DO ORDAIN AS FOLLOWS:

Section 1. Pursuant to Section 118-126 of the Municipal Code entitled "Prohibitions and Restrictions Authorized," the north side of Greenfield Avenue from the west curb line of S. 9th Street to 40 feet west of the west curb line of S. 9th Street is hereby added to the list of locations where parking is not permitted.

Section 2. Pursuant to Section 118-126 of the Municipal Code entitled "Prohibitions and Restrictions Authorized," the west side of Greenfield Avenue from the west curb line of S. 9th Street to 110 feet east of the west curb line of S. 9th Street is hereby added to the list of locations where parking is not permitted.

Section 3. Pursuant to Section 118-126 of the Municipal Code entitled "Prohibitions and Restrictions Authorized," the east side of Greenfield Avenue from the east curb line of S. 9th Street to 70 feet south of the east curb line of S. 9th Street is hereby added to the list of locations where parking is not permitted.

Section 4. The Department of Public Works and the Police Department are hereby authorized and directed to install the signs to give notification of the aforementioned parking restrictions.

PW

Section 5. All ordinances or parts thereof in conflict with the provisions of this ordinance are hereby repealed to the extent of such conflict, and this ordinance shall be in effect from and after its passage and publication.

Dean Dekker

James Perdue

I HEREBY CERTIFY that the foregoing Ordinance was duly passed by the Common Council of the City of Sheboygan, Wisconsin, on the _____ day of _____, 20____.

Dated_____ 20____. _____, City Clerk

Approved_____ 20____. _____, Mayor

CITY OF SHEBOYGAN

REQUEST FOR PUBLIC WORKS COMMITTEE CONSIDERATION

ITEM DESCRIPTION: An ordinance creating three no parking zones in the vicinity of Greenfield Ave. and S. 9th Street.

REPORT PREPARED BY: Ryan Sazama, City Engineer

REPORT DATE: December 9, 2021 **MEETING DATE:** December 14, 2021

FISCAL SUMMARY:

Budget Line Item:	N/A
Budget Summary:	N/A
Budgeted Expenditure:	N/A
Budgeted Revenue:	N/A

STATUTORY REFERENCE:

Wisconsin Statutes:	N/A
Municipal Code:	N/A

BACKGROUND / ANALYSIS: In 2020 and 2021 Sheboygan Christian School located at 929 Greenfield Avenue constructed an addition to this school. This addition was constructed so that the elementary students from their school on Geele Avenue could be relocated to the Greenfield Avenue School therefore having all students at one location. With the addition of students is the addition of vehicular traffic. Sheboygan Christian staff does the majority of the monitoring of student and bus drop off and pick up. One traffic issue that the residential neighborhood and school staff had concerns with is the parking of vehicles at the intersection of Greenfield Avenue and S. 9th Street. This intersection is narrow-skewed therefore with the additional traffic there are vehicular site distance concerns. To eliminate the site distance concerns at this intersection No Parking is being proposed at this intersection.

STAFF COMMENTS: Due to the safety reasons stated above City staff supports the request.

ACTION REQUESTED: Motion to recommend the Common Council adopt G.O. No. 32-21-22 creating three no parking zones in the vicinity of Greenfield Ave. and S. 9th Street.

ATTACHMENTS:

I. G.O. No. 32-21-22

Subs. of Res. No. ___ - 21 - 22. By Alderpersons Dekker and Perrella.
December 6, 2021.

A RESOLUTION authorizing the appropriate City officials to execute agreements with Ruekert & Mielke Inc. and Data Transfer Solutions, LLC regarding the purchase and implementation of the VUEWorks Enterprise Asset Management System, and authorizing the appropriate City officials to make the necessary budget adjustments and appropriations to provide funding for these agreements.

WHEREAS, it is in the best interest of the City of Sheboygan to implement an Enterprise Asset Management (EAM) System; and

WHEREAS, after investigating multiple software systems, City Staff believes that purchasing and implementing the VUEWorks EAM System from Data Transfer Solutions, LLC with implementation assistance from Ruekert & Mielke Inc. is in the best interest of the City; and

WHEREAS, when the 2021 Budget was approved, the full cost associated with the purchase and implementation of the EAM System had not been finalized; and

WHEREAS, therefore, certain funds – such as for Municipal Service Building-Operations Building Improvements, Parks Contracted Services, Wastewater Engineering Contracted Services, Wastewater Engineering IT Equipment Maintenance, Recycling Contracted Services, and Wastewater Sanitary Sewer Maintenance Contracted Services were included in the 2021 Budget within various Public Works accounts in anticipation of the EAM System; and

WHEREAS, at this point, these funds – which total $150,000 – are appropriately used to assist in funding the purchase and implementation of the EAM System; and

WHEREAS, additional funds from the General Fund Contingency Reserve in the amount of $213,900 are also required for the purchase and implementation of the EAM System.

NOW, THEREFORE, BE IT RESOLVED: That the appropriate City officials are authorized to sign the attached agreements with Ruekert & Mielke, Inc. and Data Transfer Solutions, LLC for the purchase and implementation of the VUEWorks EAM System.

BE IT FURTHER RESOLVED: That the Finance Director is authorized to increase the previously budgeted appropriation for Capital Improvements Fund – Capital Projects Fund – Software (Account No. 40017100-642250) by $363,900.

DRAFT

BE IT FURTHER RESOLVED: That the revenue to support this increased appropriation comes from the following locations:

- $5,000 in General Fund – Municipal Service Building-Operations Building Improvements (Account No. 10133110-524110)
- $5,000 in General Fund – Parks Contracted Services (Account No. 10153000-521900)
- $213,900 in General Fund - Contingency Reserve (Account No. 10199021-810103)
- $15,000 in Proprietary Funds - Recycling Contracted Services (Account No. 62034001-521900)
- $100,000 in Proprietary Funds Wastewater Sanitary Sewer Maintenance Contracted Services (Account No. 60134110-521900)
- $25,000 in General Fund – Engineering Office – Other Equipment (Account No. 10132100-649100).

BE IT FURTHER RESOLVED: That the appropriate City officials are authorized to draw funds pursuant to the terms of the attached agreements from the Capital Improvements Fund – Capital Projects Fund – Software (Account No. 40017100-642250).

BE IT FURTHER RESOLVED: That for the avoidance of doubt, the appropriate City officials may continue to pay the annual Software Maintenance and annual Software Hosting costs identified in the attached agreements to the extent funds are appropriated in the City's annual budget.

DRAFT

_____

_____

I HEREBY CERTIFY that the foregoing Resolution was duly passed by the Common Council of the City of Sheboygan, Wisconsin, on the _____ day of , 20____.

Dated _____ 20____. _____, City Clerk

Approved _____ 20____. _____, Mayor

OTHER MATTERS

7.3

III

Res. No. 112 - 21 - 22. By Alderpersons Dekker and Perrella.
December 6, 2021.

A RESOLUTION authorizing the appropriate City officials to execute agreements with Ruekert & Mielke Inc. and Data Transfer Solutions, LLC regarding the purchase and implementation of the VUEWorks Enterprise Asset Management System, and authorizing the appropriate City officials to make the necessary budget adjustments and appropriations to provide funding for these agreements.

WHEREAS, it is in the best interest of the City of Sheboygan to implement an Enterprise Asset Management (EAM) System; and

WHEREAS, after investigating multiple software systems, City Staff believes that purchasing and implementing the VUEWorks EAM System from Data Transfer Solutions, LLC with implementation assistance from Ruekert & Mielke Inc. is in the best interest of the City; and

WHEREAS, when the 2021 Budget was approved, the full cost associated with the purchase and implementation of the EAM System had not been finalized; and

WHEREAS, therefore, certain funds - such as for Municipal Service Building-Operations Building Improvements, Parks Contracted Services, Wastewater Engineering Contracted Services, Wastewater Engineering IT Equipment Maintenance, Recycling Contracted Services, and Wastewater Sanitary Sewer Maintenance Contracted Services were included in the 2021 Budget within various Public Works accounts in anticipation of the EAM System; and

WHEREAS, at this point, these funds - which total $150,000 - are appropriately used to assist in funding the purchase and implementation of the EAM System; and

WHEREAS, additional funds from the General Fund Contingency Reserve in the amount of $213,900 are also required for the purchase and implementation of the EAM System.

NOW, THEREFORE, BE IT RESOLVED: That the appropriate City officials are authorized to sign the attached agreements with Ruekert & Mielke, Inc. and Data Transfer Solutions, LLC for the purchase and implementation of the VUEWorks EAM System.

BE IT FURTHER RESOLVED: That the Finance Director is authorized to increase the previously budgeted appropriation for Capital Improvements Fund - Capital Projects Fund - Software (Account No. 40017100-642250) by $363,900.

BE IT FURTHER RESOLVED: That the revenue to support this increased appropriation comes from the following locations:

- $10,000 in General Fund - Municipal Service Building-Operations Building Improvements (Account No. 10153000-521900)

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- $10,000 in General Fund - Parks Contracted Services (Account No. 10156100-642500)
- $213,900 in General Fund - Contingency Reserve (Account No. 10199021-810103)
- $10,000 in Proprietary Funds - Wastewater Engineering Contracted Services (Account No. 60132100-521900)
- $10,000 in Proprietary Funds - Wastewater Engineering IT Equipment Maintenance (Account No. 60132100-523310)
- $10,000 in Proprietary Funds - Recycling Contracted Services (Account No. 62034001-521900)
- $100,000 in Proprietary Funds Wastewater Sanitary Sewer Maintenance Contracted Services (Account No. 60134110-521900 - $100,000).

BE IT FURTHER RESOLVED: That the appropriate City officials are authorized to draw funds pursuant to the terms of the attached agreements from the Capital Improvements Fund - Capital Projects Fund - Software (Account No. 40017100-642250).

BE IT FURTHER RESOLVED: That for the avoidance of doubt, the appropriate City officials may continue to pay the annual Software Maintenance and annual Software Hosting costs identified in the attached agreements to the extent funds are appropriated in the City's annual budget.

Dean Dibble

Trevor Rinella

I HEREBY CERTIFY that the foregoing Resolution was duly passed by the Common Council of the City of Sheboygan, Wisconsin, on the _____ day of _____, 20____.

Dated _____ 20____. _____, City Clerk

Approved _____ 20____. _____, Mayor

AGREEMENT
BETWEEN THE CITY OF SHEBOYGAN, WISCONSIN AND
RUEKERT & MIELKE, INC.

TO ASSIST WITH THE IMPLEMENTATION OF ENTERPRISE ASSET MANAGEMENT SOFTWARE FOR THE DEPARTMENT OF PUBLIC WORKS

This Agreement ("Agreement") is made and entered into effective this ____ day of _____, _____ (the "Effective Date"), by and between the City of Sheboygan (the "City"), a municipal corporation, and Ruekert & Mielke, Inc. ("Consultant").

WITNESSETH:

WHEREAS, the City's Department of Public Works desires to implement the DTS/VUEWorks Enterprise Asset Management system; and

WHEREAS, the City desires to retain a firm to assist the City with its implementation of that system; and

WHEREAS, Consultant desires to provide the City with these necessary services, pursuant to the terms of this Agreement.

NOW, THEREFORE, in consideration of the mutual covenants herein contained, the parties hereto agree as follows:

Article 1. Scope of Services
Consultant shall provide the services identified in the Asset Management Implementation Plan and Scope of Services, which is attached to this Agreement as Attachment A (the "Services").[1] The Services shall be performed in accordance with the Asset Management Implementation Project Approach, which is attached to this Agreement as Attachment B. Consultant shall provide Hosting Services of the VUEWorks Software as detailed in Attachment C - Hosting. Consultant shall provide software maintenance and support Services as detailed in Attachment D – Software Maintenance and Support.

Consultant shall host the VueWorks Software for the duration of the Services or until the City's Project Manager requests that the VueWorks Software be transferred to another hosting solution. Consultant shall assist the City with transferring the VueWorks Software from its hosting solution to another hosting solution selected by the City.

For the avoidance of doubt, the City shall be responsible for the "City Responsibilities" identified in Attachments A, B, C, and D.

[1] To the extent the Attachments conflict with the terms of this Agreement, the terms of this Agreement shall govern.

Article 2. Standard of Care
In fulfilling its obligations and responsibilities, Consultant shall be expected to comply with and its performance evaluated in light of the standard of care expected of professionals in the industry performing similar services on projects of like size and complexity at that time in the same region (the "Standard of Care"). Consultant will, without additional compensation, correct or replace any and all Services not meeting the Standard of Care.

Consultant shall have the right to rely on the accuracy of any information provided by the City.

Article 3. The City's Project Manager
The Director of Public Works shall designate an appropriate project manager for purposes of this Agreement. The project manager shall have the authority to transmit instructions, receive information, and render decisions relative to the Agreement on behalf of the City.

Article 4. Compensation
As set forth in Exhibit 1 (Schedule of Costs and Invoicing), which is attached to this Agreement, the City shall pay Consultant for the following services:

$214,500 for Implementation Services.[2]
$2,400 for Report Training Sessions.[2]
$25,000 for Integrations.[2]

As set forth in Exhibit 1 (Schedule of Costs and Invoicing), which is attached to this Agreement, the City shall pay Consultant a fixed amount annually for the following services:

$17,000 for Software Maintenance[2]
$20,000 for Software Hosting[2]

Consultant shall submit monthly invoices to the City via first class mail postage prepaid or via email. Invoices shall be sent to:

David Biebel
City of Sheboygan
2026 New Jersey Ave.
Sheboygan, Wisconsin 53081
david.biebel@sheboyganwi.gov

The City will pay undisputed invoices within forty-five (45) days of receipt of the invoice. If Owner fails to make payment on an undisputed invoice within forty-five (45) days of receipt of the invoice, the amounts due Consultant shall be increased at the rate of 1.0% per month (or the maximum rate of

[2] Exhibit 1 also reflects certain payments due to DTS. The City shall make any payments due to DTS pursuant to the terms and conditions of the City's separate agreement with DTS.

interest permitted by law, if less) from the 45th day. In addition, as set forth in Article 8, Consultant may – after giving seven (7) days written notice to the City – suspend services under this Agreement until Consultant has been paid in full all amounts due for services, expenses, and other related charges.

Additional services not set forth in Article 1, or changes in the Services must be authorized in writing by the City or its designated Project Manager prior to such work being performed, or expenses incurred. The City shall not make payment for any unauthorized work or expenses.

Article 5. Appropriation of Funds

If funds for the continued fulfillment of this Agreement by the City are at any time not forthcoming or are insufficient, through failure of any entity, including the City itself, to appropriate funds or otherwise, then the City shall have the right to terminate this Agreement without penalty.

Article 6. Schedule

As set forth in Attachment B, the Parties anticipate Consultant's services being conducted in three phases, and being completed no sooner than April 2023.

The Parties agree that no charges or claims for damages shall be made by Consultant for any delays or hindrances, from any cause whatsoever, during the progress of any portion of the services specified in the Agreement. Such delays or hindrances, if any, may be compensated for by an extension of time for a reasonable period as may be mutually agreed upon between the Parties, it being understood however, that permitting Consultant to proceed to complete any service, or any part of the services / project, after the date to which the time of completion may have been extended shall, in no way operate as a waiver on the part of the City of any of its rights herein.

Article 7. Open Records

Both parties understand that the City is bound by the Wisconsin Public Records Law and, as such, this contract is subject to that law. Consultant acknowledges that it is obligated to assist the City in retaining and producing records that are subject to the Wisconsin Public Records Law, and that the failure to do so shall constitute a material breach of the contract, and that Consultant must indemnify and hold the City harmless from liability under that law. Except as otherwise authorized by the City's Project Manager, those records shall be maintained for a period of seven (7) years after receipt of final payment under the Agreement.

Article 8. Termination

The City may terminate or suspend performance of this Agreement at the City's prerogative at any time upon thirty (30) calendar days written notice to Consultant. The City's Project Manager shall have the authority to provide this written notice. Consultant shall terminate or suspend performance of the Services on a schedule acceptable to the City and the City shall pay Consultant for all the Services performed up to the date that written notice is received, plus reasonable termination or suspension expenses. Upon restart, an equitable adjustment shall be made to Consultant's compensation and the schedule of services.

In the event of a party's substantial failure to perform in accordance with the terms of this Agreement, the other party shall have the right to terminate the Agreement upon written notice. The

nonperforming party shall have seven (7) calendar days from the receipt of the termination notice to cure or to submit a plan for cure acceptable to the other party.

Upon any termination or expiration of this Agreement: (i) Consultant shall cease providing access to the Hosted Software; (ii) Consultant will cease performing all services being provided under this Agreement; (iii) promptly following the written request of the other party, each party will promptly return to the other party or destroy (in accordance with the other party's request) all property and equipment of the other party in its possession or control, including all copies thereof, and will certify in writing that it has complied with such request, and (iv) within forty-five (45) days of the date of termination or expiration of this Agreement, as the case may be Consultant shall provide City with a download of the City Data. After such 45-day period, Consultant shall have no obligation to maintain or provide any City Data and may thereafter, unless legally prohibited, delete all City Data provided that Consultant provided written notice of the intent to delete City Data.

Article 9. Ownership of Documents and Intellectual Property

All materials developed, prepared, completed, or acquired by Consultant during the performance of the Services specified in this Agreement, including all finished or unfinished surveys, data, drawings, maps, photographs, and reports, shall become the property of the City and shall be delivered to the City during the contract period. Such materials shall not be released by Consultant or used for other purposes at any time without the written approval of Owner.

No drawings, maps, photographs, documents, reports, or other data prepared or completed under this Agreement shall be copyrighted by Consultant, nor shall any notice of copyright be registered by Consultant in connection with any such material prepared or completed under this Agreement.

For the avoidance of doubt, Consultant shall retain its ownership rights in its databases, computer software, and other proprietary property. Intellectual property developed or utilized in the performance of the Services shall remain the property of Consultant.

Article 10. Identity of Consultant

Consultant acknowledges that one of the primary reasons for its selection by the City to perform the Services is the qualifications and experience of Consultant. Consultant thus agrees that the Services to be performed pursuant to this Agreement shall be performed by Consultant. Consultant shall not subcontract any part of the Services without the prior written permission of the City. The City's Project Manager shall have the ability to provide this written permission. The City reserves the right to reject any of Consultant's personnel or proposed outside professional sub-consultants, and the City reserves the right to request that acceptable replacement personnel be assigned to the project.

Article 11. Independent Contractor Status

During the entire term of this Agreement, Consultant shall be an independent contractor, and in no event shall any of its personnel, agents or sub-contractors be construed to be, or represent themselves to be, employees of the City. Consultant shall be solely responsible for the payment and reporting of all employee and employer taxes, including social security, unemployment, and any other federal, state, or local taxes required to be withheld from employees or payable on behalf of its employees.

Article 12. Indemnification

a. *Consultant's Indemnification of the City*

To the extent permitted by law, Consultant hereby agrees to indemnify and hold the City, its elected and appointed officials, officers, employees, agents, representatives, and volunteers, and each of them, harmless from and against any and all suits, actions, legal or administrative proceedings, claims, demands, damages, liabilities, interest, attorneys' fees, costs, and expenses caused by reason of any negligent act, omission, or fault of Consultant or of anyone acting under its direction or control or on its behalf. This includes payment of reasonable costs of defense. The obligation to indemnify and hold the City, its elected and appointed officials, officers, employees, agents, representatives and volunteers, and each of them, harmless shall be applicable unless liability results from the sole negligence of the City, its elected and appointed officials, officers, employees, agents, representatives or volunteers.

Consultant shall also reimburse the City, its elected and appointed officials, officers, employees, agent or authorized representatives or volunteers for any and all legal expenses and costs incurred by each of them in connection therewith or in enforcing the indemnity herein provided.

In the event that Consultant employs other approved persons, firms, corporations or entities (collectively Subcontractor) as part of performing its obligations under this Agreement, it shall be Consultant's responsibility to require and confirm that each Subcontractor enters into an Indemnity Agreement in favor of the City, its elected and appointed officials, officers, employees, agents, representatives and volunteers, which is identical to this indemnity provision.

This indemnity provision shall survive the termination or expiration of this Agreement.

b. *City's Indemnification of Consultant*

To the extent permitted by law, the City hereby agrees to indemnify and hold Consultant, Consultant's officers, directors, partners, employees, and consultants, and each of them, harmless from and against any and all suits, actions, legal or administrative proceedings, claims, demands, damages, liabilities, interest, attorneys' fees, costs, and expenses caused solely by the negligent acts or omissions of the City or the City's elected and appointed officials, officers, employees, agent or authorized representatives or volunteers with respect to this Agreement.

This indemnity provision shall survive the termination or expiration of this Agreement.

c. *Limitation of Liability*

To the extent permitted by law, the total liability, in the aggregate, of Consultant and Consultant's officers, directors, partners, employees, agents, and consultants, or any of them to the City and anyone claiming by, through, or under the City, for any and all injuries, losses, damages, and expenses, whatsoever arising out of, resulting from, or in any way related to this Agreement from any cause or causes, including but not limited to the negligence, professional errors or omissions, strict liability or

breach of contract or warranty, express or implied, of Consultant or Consultant's officers, directors, partners, employees, agents, and consultants, or any of them, shall not exceed the total amount of $2,000,000.

Article 13. Insurance

Consultant shall not commence work under this Agreement until it has obtained all insurance required under this Article. Additionally, Consultant shall not allow any approved Subcontractor to commence work on its subcontract until the Subcontractor has obtained all insurance required under this Article.

During the performance of any and all Services under this Agreement, Consultant shall maintain the following insurance in full force and effect, and shall – upon request – provide proof of insurance to the City's designated Project Manager listing the City of Sheboygan as an additional insured:

a. Commercial General Liability Insurance – Consultant shall acquire and maintain, for the duration of the Agreement, Commercial General Liability Insurance of at least $1,000,000 per occurrence and $2,000,000 in the aggregate.

b. Automobile Liability Insurance – Consultant shall acquire and maintain, for the duration of the Agreement, Automobile Liability Insurance of at least $1,000,000.

c. Workers' Compensation Insurance – Consultant shall acquire and maintain, for the duration of the Agreement, Workers' Compensation Insurance that meets all statutory requirements. In the event this Agreement authorizes any work to be sublet, Consultant shall require any contractor to similarly provide Workers' Compensation Insurance in accordance with all statutory requirements.

d. Professional Liability Insurance – Consultant shall acquire and maintain, for the duration of the Agreement, Professional Liability covering negligent acts, errors and omissions in the performance of professional services with policy limits of not less than Two Million Dollars ($2,000,000) per claim. Owner will not be added as an additional insured to Engineer's Professional Liability coverage.

All insurance must be primary and non-contributory to any insurance or self-insurance carried by the City.

The proof of insurance referenced above shall require the insurance company to notify the City at least 30 days prior to the expiration, cancellation, non-renewal, or material change in the coverage. The Certificate Holder on the proof of insurance should be listed as:

City of Sheboygan, Wisconsin
828 Center Ave.
Sheboygan, Wisconsin 53081

The insurance coverage required must be provided by an insurance carrier with the "Best" rating of "A-VII" or better.

Approval of the insurance by the City shall not relieve or decrease the extent to which Consultant may be held responsible for payment of damages resulting from Consultant's provision of the Services or its operations under this Agreement. If Consultant fails or refuses to procure or maintain the insurance required by these provisions, or fails or refuses to furnish the City the required proof that the insurance has been procured and is in force and paid for, the City shall have the right at its election to terminate the Agreement.

Article 14. Conflict of Interest
Consultant declares that it has no present interest, nor shall it acquire any interest, direct or indirect, which would conflict with the performance of Services under this Agreement. Consultant agrees that no person having any such interest shall be employed in the performance of this Agreement.

Article 15. Waiver
No failure of either party to enforce a term of this Agreement against the other shall be construed as a waiver of that term, nor shall it in any way affect the party's right to enforce that term. No waiver by any party of any term of this Agreement shall be considered to be a waiver of any other term or breach thereof.

Article 16. Severability
The invalidity, illegality, or unenforceability of any provision of this Agreement, or the occurrence of any event rendering any portion or provision of this Agreement void shall in no way affect the validity or enforceability of any other portion or provision of this Agreement. Any void provision shall be deemed severed from this Agreement, and the balance of the Agreement shall be construed and enforced as if it did not contain the particular provision to be held void. The parties further agree to amend this Agreement to replace any stricken provision with a valid provision that comes as close as possible to the intent of the stricken provision. The provisions of this Article shall not prevent this entire Agreement from being void should a provision which is of the essence of this Agreement be determined void.

Article 17. Assignment
Neither the City nor Consultant shall assign any rights or duties under this Agreement without the prior written consent of the other party.

Article 18. Third Party Rights
Nothing in this Agreement shall be construed to give any rights or benefits to anyone other than the City and Consultant.

Article 19. Governing Law and Venue
This Agreement shall be governed by the laws of the State of Wisconsin. Venue of any disputes arising under this Agreement shall be in the Sheboygan County Circuit Court, Wisconsin.

Article 20. Non-Discrimination
In connection with the performance of work under this Agreement, Consultant agrees not to discriminate against any employee or applicant for employment because of age, race, religion, color,

handicap, sex, physical condition, developmental disability (as defined in Wis. Stat. 51.01(5)), sexual orientation (as defined in Wis. Stat. 111.32(13m)), or national origin. This provision shall include, but not be limited to, the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. Consultant further agrees to take affirmative action to ensure equal employment opportunities.

Article 21. Compliance with Laws
In performing the Services under this Agreement, Consultant shall comply with any and all applicable federal, state, and local statutes, ordinances, plans, and regulations.

The City reserves the right to cancel this Agreement if Consultant fails to follow the requirements of Wis. Stat. 77.66 and related statutes regarding certification for collection of sales and use tax. The City also reserves the right to cancel this Agreement with any state or federally debarred contractor.

Consultant shall have any and all licenses and permits required to perform the work specified, and shall furnish proof of such licensing authorization and permits upon request.

Article 22. Notices
Any notice required by this Agreement shall be made in writing to the individuals/addresses specified below:

City:		**Consultant:**
City Clerk		Kevin J. Wagner
City of Sheboygan		Ruekert & Mielke, Inc.
828 Center Ave.		1400 Lombardi Avenue, Suite 101S
Sheboygan, Wisconsin 53083		Green Bay, Wisconsin 54304

Nothing contained in this Article shall be construed to restrict the transmission of routine communications between representatives of the City and Consultant.

Article 23. Intent to be Bound
The City and Consultant each binds itself and its successors, executors, administrators, permitted assigns, legal representatives and, in the case of a partnership, its partners to the other party to this Agreement, and to the successors, executors, administrators, permitted assigns, legal representatives and partners of such other party in respect to all provisions of this Agreement.

Article 24. Force Majeure
Neither party shall be in default by reason of any failure in performance of this Agreement in accordance with reasonable control and without fault or negligence on their part. Such causes may include, but are not restricted to, acts of nature or the public enemy, acts of the government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and unusually severe weather. In every case, the failure to perform must be beyond the reasonable control and without the fault or negligence of the party.

Article 25. Integration and Modification
This Agreement, including all Exhibits and Attachments incorporated by reference, represents the entire and integrated agreement between the City and the Consultant. It supersedes all prior and contemporaneous communications, representations and agreements, whether oral or written, relating to the subject matter of this Agreement. This Agreement may be modified only by a written amendment signed by both parties hereto.

Article 26. Non-Collusion
Consultant is certifying, under penalty of perjury, that to the best of its knowledge and belief:

a. The prices in its quote were arrived at independently, without collusion, consultation, communication, or agreement, for the purpose of restricting competition as to any other matter relating to such prices with any other competitor.
b. No attempt was made to induce any other person, partnership, or corporation to submit or not submit a quote to the City for these Services for the purpose of restricting competition.

Article 27. Other Provisions

a. Foreign Corporation. A foreign corporation (any corporation other than a Wisconsin corporation) which becomes a party to this Agreement is required to conform to all the requirements of Wis. Stat. 180 relating to a foreign corporation, and must possess a certificate of authority from the Wisconsin Department of Financial Institutions, unless the corporation is transacting business in interstate commerce or is otherwise exempt from the requirement of obtaining a certificate of authority.

b. Authority. Each person executing this Agreement on behalf of a party hereto represents and warrants to the other party: That the execution and delivery of this Agreement has been duly authorized, that the person or persons executing this Agreement have the full power, authority, and right to do so, and that such execution is sufficient and legally binding on such party to enable this Agreement to be enforceable in accordance with its terms.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed the day and year first written above.

CITY OF SHEBOYGAN, WISCONSIN	**CONSULTANT**
BY: _____	**BY:** _____
DATE: _____	**DATE:** _____

Authorized by Res. No. _____-21-22.

Exhibit 1: Schedule of Costs and Invoicing

Services	Fee	Total Fee	Comments
VUEWorks Software License DTS		$85,000	Due at Contract Execution
Software Maintenance (Annually) RM		$17,000	Due on Go-Live of the software prorated to and subsequently on the anniversary of Contract Execution, _____, 2021
Software Hosting (Annually) RM		$20,000	Due on Contract Execution and subsequently on the anniversary of Contract Execution, _____, 2021
Implementation Services RM			Invoiced by individual task component, by percentage as completed
Task 1: Startup Services & Installation			
Startup Services & Installation	$10,000		
Phase 1 Administration	$5,000		
Phase 2 Administration	$5,000		
Phase 3 Administration	$5,000		
Task 1 Subtotal	***$25,000***		
Task 2: Kickoff Meeting			
Phase 1 - Streets, Forestry and Parks	$1,000		
Phase 2 - Sanitation, Facilities and Traffic	$1,000		
Phase 3 - Engineering, Motor Vehicles, WW Treatment	$1,000		
Task 2 Subtotal	***$3,000***		
Task 3: Work Management Implementation			
Engineering	$8,000		
Parks & Forestry	$8,000		
Streets & Bridges	$8,000		
Storm Sewer and Stormwater Management	$8,000		
Sanitary Sewer	$8,000		
Sanitation & Recycling	$8,000		
Facilities	$8,000		
Traffic	$8,000		
Motor Vehicles & Equipment	$8,000		
Wastewater Treatment	$12,000		
Task 3 Subtotal	***$84,000***		
Task 4: Resource Management Implementation			
Public Works	$8,000		
Motor Vehicles & Equipment	$7,000		
Task 4 Subtotal	***$15,000***		
Task 5: Facilities Module Implementation			
Parks & Forestry	$8,000		
Facilities	$10,000		
Wastewater Treatment	$15,000		
Task 5 Subtotal	***$33,000***		
Task 6: Capital Planning Implementation			
Engineering	$4,000		
Parks & Forestry	$4,000		
Streets, Storm, Sanitation and Sewer	$8,000		
Facilities	$4,000		
Traffic	$3,000		
Motor Vehicles & Equipment	$3,000		
Wastewater Treatment	$4,000		
Task 6 Subtotal	***$30,000***		
Task 7: Administrator Training			
Work Management	$7,500		
Capital Planning	$5,000		
Task 7 Subtotal	***$12,500***		
Task 8: Staff Training			
Phase 1	$4,000		
Phase 2	$4,000		
Phase 3	$4,000		
Task 8 Subtotal	***$12,000***		
Task 9: Data Conversion Services			It is Assumed that no data conversion service needs are anticipated. Data conversion services can be provided on a time and materials basis.
Task 9 Subtotal	***$0***		
Total Implementation Costs		$214,500	
Reporting Training Sessions RM		$2,400	Assumes 2 City staff will utilized the DTS Online Report Training Courses
Integrations (See the Scope of Work below for details) RM		$25,000	$15,000 due upon completion of integrations per the scope of work listed below. $10,000 due upon completion of user acceptance testing.

1. Data must be made available to R/M and DTS in an ODBC compliant database to make use of the VUEWorks data linking capabilities. DTS will need access to the APIs and data models associated with the software intended for integration. A more detailed integration plan will be developed after the project commences and DTS can more fully explore and document the needs of the City as well as what is available from these other software's such as data models, databases and APIs.

2. Integrations shall include Hach WIMS - One Way, Scada One way, IT Pipes One way, AVL software Precise No Map Service, PASER, Fuelmaster and MUNIS Two way.

ATTACHMENT A

CITY OF SHEBOYGAN, WI
ASSET MANAGEMENT IMPLEMENTATION PLAN AND SCOPE OF SERVICES

VUEWORKS INSTALLATION, CONFIGURATION, TESTING AND TRAINING

City personnel knowledgeable with, and responsible for, the City's IT environment and GIS software installation and usage will be highly utilized through the installation and implementation process. These individuals should have, and be able to provide, full access to the City's servers and hardware & software configuration, and should be available and have authority to make decisions related to hardware and software configurations and user permissions.

City staff responsible for data management and workflow processes should also be available to provide information to Ruekert & Mielke, Inc. (R/M) on an "as needed" basis. These individuals, or others knowledgeable with the City's daily operations and workflow procedures, should be available to assist with the development of Service Request types, Work Order forms, and Resource Manager tables (Labor, Equipment, and Inventory).

IMPLEMENTATION PLAN SUMMARY

R/M will utilize the following Implementation Plan for the City's Asset and Infrastructure Management project as summarized below:

- **Task 1: Startup Services and Installation**
  R/M will review the City's GIS data to verify what data is suitable to populate within the VUEWorks database. R/M will install the VUEWorks software on an R/M hosted site through Amazon Web Services. This site we will be accessible for use by City staff and residents from a website address and can be reached from a web browser with an internet connection.

- **Task 2: Kickoff Meetings** (Onsite, 4 hrs.)
  The goal of this meeting is to clearly identify the subject matter experts, VUEWorks Administrator(s), and other points of contact between VUEWorks and the Customer. The meeting will establish dates and over all initial project timeline.

  Total Kickoff Meetings = 3
  - Phase 1 (Streets, Forestry and Parks)
  - Phase 2 (Sanitation, Facilities and Traffic)
  - Phase 3 (Engineering, Vehicles & Equipment, Wastewater Treatment)

- **Task 3: Standard Work Management Implementation**
  Iterations for the following VUEWorks modules and applications within the City's Departments as shown in Exhibit 1 and detailed below.
  - Service Request
  - Work Order
  - WorkOrderVUE Mobile Application
  - Work Management Reporting

  Total Standard Work Management Implementations for City Departments = 10
  - Engineering
  - Parks & Forestry
  - Streets & Bridges
  - Storm Sewer and Stormwater Management
  - Sanitary Sewer
  - Sanitation & Recycling
  - Facilities
  - Traffic
  - Motor Vehicles & Equipment
  - Wastewater Treatment

- **Task 4: Resource Management Implementation**
  Iterations for the following VUEWorks modules within the City's Departments as detailed below.
  - Personnel
  - Equipment
  - Inventory (Including Warehouses and Advanced Inventory)

  Total Standard Resource Management Implementations for City Departments = 2
  - City Resources
  - Motor Vehicles and Equipment

- **Task 5: Facilities Module Implementation**
  Iterations for the following VUEWorks modules and applications within the City's Departments as shown in Exhibit 1 and detailed below.
  - Facilities
  - FacilityVUE Mobile Application

  Total Standard Facility Implementations for City Departments = 3
  - Wastewater Treatment
  - Facilities
  - Parks & Forestry

  Additional implementation workshops can be conducted under an amendment to this agreement.

- **Task 6: Capital Planning Implementation**
  Iterations for the following VUEWorks modules within the City's Departments as shown in Exhibit 1 and detailed below.
  - Condition
  - Risk
  - Valuation
  - Projects
  - Budget Forecasting

  Total Capital Planning Implementations for City Departments = 7
  - Engineering
  - Parks & Forestry
  - Streets, Storm, Sanitation and Sewer
  - Facilities
  - Traffic
  - Motor Vehicles & Equipment
  - Wastewater Treatment

  Additional Implementations can be conducted under an amendment to this agreement.

- **Task 7: Administrator Training**
  R/M will work with the City to determine the most appropriate City staff to serve as "Administrator(s)" for the City's VUEWorks site and software. R/M will train the City's Administrator(s) on General site use, administrative functionality for the Core module, and each of the work management and capital planning modules to be used by the City. R/M will train the City's Administrator(s) in the following areas:
  - General site use,
  - Administrative functionality for the Core module, and each of the work management and capital planning modules to be used by the City.

- **Task 8: Staff Training**
  R/M will train City staff designated to be VUEWorks users in the following areas:
  - Introduction to VUEWorks, and access to the VUEWorks site
  - General site use including permissions, dashboards and calendars
  - Work management in VUEWorks including creating Service Requests and Work Orders, accessing information within the VUEWorks system, and resource entry for Work Orders.

- **Task 9: Data Conversion (As needed)**
  R/M understand that City staff will be performing most, if not all data conversion needed for the VUEWorks Implementation. If needed, R/M can provide data conversion services on a Time and Materials basis.

Implementation services will be tailored to best meet the City of Sheboygan's needs. The Implementation process is standardized and includes on-site configuration, and remotely held planning workshops to facilitate the on-site sessions as detailed below.

The City of Sheboygan will be prepared to take ownership of the software configuration and subsequent administration of VUEWorks during the course of the Implementation process. The Implementation Plan approach will deepen the City's participation in the implementation and training process which should result in significant progress and the ability to become self-sufficient in implementing additional work and asset management activities without R/M's or VUEWorks professional services. Upon completion of the Implementation process, the City will have a fully functional VUEWorks system, with workflow configuration completed as detailed in the Implementation scope below. Future additional VUEWorks software configuration beyond the Implementation process will be handled by City staff. Additional Implementation iterations can be conducted under a separate agreement or an amendment to this agreement.

SCOPE OF SERVICES

WORK MANAGEMENT IMPLEMENTATION

The City of Sheboygan will implement VUEWorks in the Public Works Department in a three-phased Implementation

R/M will work with City staff to map out the existing tasks completed by department staff in the areas of both service requests and work orders. The City will provide to R/M information regarding what data is collected and what is reported on, including samples of data structure and City reports as it relates to work and asset management. R/M will work with the City to map out four (4) well understood and documented work management activities.

R/M will then configure the VUEWorks system for work management in the department. R/M will use two well-defined reports from the City to create two (2) basic reports that will provide the same data output once service requests and work orders have been populated within the VUEWorks system.

Each Standard Work Management Implementation service will provide the target department with the following:

- Three days on-site w/ R/M implementation team
- Department specific implementation and configuration
- Fully functional software that is configured and ready for daily use
- Report templates configured and ready for daily use

TASK 1: STARTUP SERVICES AND INSTALLATION

R/M Will install and configure the VUEWorks software on R/M hosted servers – one development instance of VUEWorks, one test instance of VUEWorks and one production instance of VUEWorks. These servers will be hosted using Amazon cloud services

R/M will integrate the City's GIS data into VUEWorks by connecting to the City's published REST services. Any layers which should be editable in VUEWorks software will need to be accessible via ESRI Feature Service with Update Feature and Apply Edits capabilities turned on.

TASK 2: KICKOFF MEETING (ONSITE, 4 HRS.)

The goal of this meeting is to introduce the City staff to the VUEWorks software, provide a general overview of how the implementation process will work, and clearly identify the subject matter experts, VUEWorks Administrator(s), and other points of contact between R/M and the City. At this meeting, the general phasing of implementations for the departments and VUEWorks modules will be discussed, and approximate dates will be established for the project timeline.

As part of the kickoff meeting, the City will identify the **Subject Matter Expert**(s) (SME) for each of the Departments or areas of work (streets, wastewater, etc.), as well as the overall VUEWorks Administrator. The SME(s) needs to understand the entire workflow for any given activity that will be managed via work orders, but they do not necessarily need to be the employee(s) who perform the work. The purpose of the SME(s) is to break down each of the work activities into a step-by-step series of events, where at each step key information to be collected is identified, and the actions necessary to move to the next step are defined.

The **VUEWorks Administrator** is the City's lead person(s) responsible for administering the application. The VUEWorks Administrator is responsible for taking ownership of the system and will expand it over time. As such, they will need to understand the workflows, how to use the various configuration user interfaces to build new workflows, master the report designer and more.

TASK 3: STANDARD WORK MANAGEMENT IMPLEMENTATION

The City of Sheboygan will implement VUEWorks in the Engineering and Public Works Departments. The implementations will include work in the areas of Engineering, Parks & Forestry, Streets, Storm, Sanitation and Sewer, Facilities, Traffic, Motor Vehicles & Equipment, and Wastewater Treatment.

R/M will work with City staff to map out the existing tasks completed by department staff in the areas of both service requests/calls and work orders. The City will provide to R/M information regarding what data is collected and what is reported on, including samples of data structure and City reports as it relates to work and asset management. R/M will work with the City to map out four (4) well understood and documented work management activities.

R/M will then configure the VUEWorks system for work management in the department. R/M will use two well-defined reports from the City to create two (2) basic reports that will provide the same data output once service requests and work orders have been populated within the VUEWorks system.

Each Standard Work Management Implementation service will provide the target department with the following:

- Four days on-site w/ R/M implementation team
- Department specific implementation and configuration
- Fully functional software that is configured and ready for daily use
- Reports and data analysis templates configured and ready for daily use

Workshops for Standard Work Management Implementation

Workshop 3-1: Workflow Definition Workshop (Onsite, 2-4 hours)

Implementing the work management modules of VUEWorks requires careful identification of the work activities to be managed in the system and the relevant data to be recorded at the work activity level. Work activities are the most granular level of work management and form the basis for asset specific work and preventive maintenance management, reporting, and analysis. During the Workshop 3-1, City staff will identify 2 to 4 well understood asset specific work activities and 2 to 4 service requests issues related to the same asset types as the work activities. Any supporting documents such as paper-based work orders; inspection forms, service request documentation, etc. will be provided to R/M via email. R/M will review the information during and after the workshop. R/M will define the workflow for these activities as part of Workshop 3-1.

The goal of the workshop is to begin defining how VUEWorks will be configured from a workflow perspective. The process of defining work activities in a work order system can be complex initially. This stems from the fact that any given work activity is composed of several parts: work planning, work assignment, doing the actual work, and closing out the task or work order correctly. The challenge in implementing any work management system is that the above steps are often not completely understood by a single individual; in fact, it is more common for these steps to be handled in a sequential fashion with different staff largely confined to one or two parts of the sequence. In addition, when City staff begin defining these steps for an automated process, it is common for changes to be introduced to the workflow process.

The City's SME(s) is essential in diagramming the workflow, which is the baseline from which VUEWorks is then configured.

Workshop 3-2: Workflow Identification & Classification Workshop (Onsite, 2-4 Hours)

The first goal of this workshop is to define the tasks and activities that department staff complete on a regular basis. Understanding the full scope of work completed by each Department will provide a more comprehensive view of all the work that the Department is responsible for and increase the effectiveness of classification and mapping of these workflows.

The second goal of this workshop is to determine what Department work would be classified as a Service Request, and what would be classified as a Work Order. Workflows be used to relate

Service Requests and Work Orders, and work will be divided into appropriate Groups to facilitate more efficient use of user permissions, reporting, and other work management within VUEWorks.

Workshop 3-3: Workflow Mapping Workshop (Onsite, 2-4 hours)

The goal of this workshop is to walk through work management activities from start to finish and determine how the process will be completed in VUEWorks from the start of a Service Request to the final closeout of a Work Order. R/M will work with the City to map out four (4) well understood and documented work management activities.

The actual content of the work order form in VUEWorks is highly configurable. The content of the Work Order has two drivers:

- Workflow of the specific activity
- Data required to be captured in the course of performing the work activity.

Based on the completed workflow exercise, the R/M implementation team will create a draft work order specification for each work activity, and an associated work order form set up in the VUEWorks software for live interaction during Workshop 3-4.

Workshop 3-4: Final Workflow Configuration Workshop (Onsite, 2-4 hours)

This workshop marks a turning point in the implementation process. Final changes will be made to the work order specification documents as well as the actual work order forms in VUEWorks. R/M will update the specification documents during the workshop; however, the VUEWorks Administrator will perform updates to the actual work order forms in VUEWorks as well as service request issues. The SME(s) and the VUEWorks Administrator will step through the workflow process in a role-playing exercise to test drive the configuration. R/M will step through the reporting capabilities of the system, and the VUEWorks Administrator (and others in attendance as appropriate) will run reports and learn how to create their own reports.

As part of this workshop the City will sign off on the work order specification and service request issues, as well as the Final configuration of the Service Request and Work Order forms for the four workflows mapped in Workshop 3-4.

During this workshop, the SME(s) and VUEWorks Administrator will be exposed to the actual work management modules in VUEWorks to begin designing actual work order forms, service request issues, reports, and dashboard gadgets. Data entry requirements for employee names, pay rates, rate types (e.g., Standard, Overtime, etc.); with similar information for equipment and inventory will be identified. The VUEWorks Administrator will populate this data into the appropriate VUEWorks tables.

Upon completion of this workshop, the VUEWorks Administrator will be able to modify the existing work order configuration (both the workflow and the content of the actual work order

forms) that the implementation team created within the VUEWorks system. The VUEWorks Administrator will also be capable of creating reports.

TASK 4: RESOURCE MANAGEMENT IMPLEMENTATION

The City of Sheboygan will implement the Resource Management Module in the areas of Engineering, Parks & Forestry, Streets, Storm, Sanitation and Sewer, Facilities, Traffic, Motor Vehicles & Equipment, and Wastewater Treatment. This module will allow for the entry of labor, equipment and inventory for each work orders created.

TASK 5: FACILITIES MODULE IMPLEMENTATION

The City of Sheboygan will implement the Facilities Module in the Parks and Forestry, Wastewater Treatment and Facilities Departments. The implementations will include work in the areas of the Wastewater Treatment Plant and the City's building and park facilities.

R/M will work with City staff to review each facility maintained by the City. The City will provide to R/M information regarding what data is collected and what is reported on, including samples of data structure and City reports as it relates to facility inspections, recurring maintenance, and asset management.

R/M will then configure the VUEWorks system for work management in the department. R/M will add a facilities GIS layer into the application and associate a building template with each City owned facility. Each facility will have a general breakdown of each asset class. R/M will set up 5 recurring work orders for each facility and configure 2 custom inspections forms for each of the departments.

The Facilities Model & Implementation service will provide the target departments with the following:

- Two days on-site w/ R/M implementation team
- Department specific implementation and configuration
- 5 Scheduled recurring work orders for each facility.
- 2 Fully functional inspection reports within VUEWorks that are configured and ready for daily use

Workshops for Facilities Module Implementation

Workshop 5-1: Facilities Management Definition (Onsite - ½ Day)

Implementing the Facilities modules of VUEWorks requires identification of all facilities managed by the City. Facilities Management inspection is one of the most complexed forms of asset management, and provides the basis for preventive maintenance management, reporting, and analysis.

Prior to Workshop 5-1, City staff will identify the major buildings, processes and the components that make up each system. Any supporting documents such as existing work orders, paper-based inspection forms, recurring maintenance, etc. will be provided to R/M via email. R/M will review the information prior to the workshop and will define the structure of the building templates for these facilities as part of Workshop 5-1. R/M will review the City's existing work orders and inspection reports, and work with City staff to determine how to configure these activities within VUEWorks prior to Workshop 5-2.

Workshop 5-2: Facilities Asset Definition (Onsite - ½ Day)

Prior to Workshop 5-2, City staff will identify all key assets maintained within their facilities, along with the key attributes to be maintained for each asset. Any supporting documents such as existing database information, asset registers, recurring maintenance, etc. will be provided to R/M via email. R/M will review the information prior to the workshop and will develop the asset definition, attributes and layout as part of Workshop 5-2.

Workshop 5-3: Final Asset Management Configuration and Software Review (Onsite – ½ Day)

During this workshop, the building and asset templates created by the R/M Implementation staff within VUEWorks will be reviewed by City staff within the VUEWorks system.

As part of this workshop the City will sign off on the building layers, building and asset template specification, as well as the final configuration of the inspection forms reviewed in Workshops 5-1 & 5-2.

Staff will walk through inspection activities from start to finish, and review how the process will be completed in VUEWorks. City staff will create live inspection forms within the system

During this workshop, the SME(s) and VUEWorks Administrator will be exposed to the actual facilities modules in VUEWorks to begin creating and modifying their asset inventor, inspection forms, and systems.

Upon completion of the 2nd workshop, the VUEWorks Administrator will be able to modify the existing building templates, asset inventory, and inspection forms that the implementation team created within the VUEWorks system.

TASK 6: CAPITAL PLANNING IMPLEMENTATION

The City of Sheboygan will implement the Valuation, Condition, Risk, Budget Forecasting and Projects Modules for key assets classes. The implementations will include work in the areas of Engineering, Parks & Forestry, Streets, Storm, Sanitation and Sewer, Facilities, Traffic, Motor Vehicles & Equipment, and Wastewater Treatment.

R/M will work with City staff to review the existing capital planning systems (condition, risk, value, etc.) used by the City if applicable. The City will provide to R/M information regarding

what data is currently utilized and what is reported on, including samples of data structure and City reports as it relates to condition inspections, valuation, risk and general asset management.

R/M will then configure the VUEWorks system for capital planning functionality for each department asset class. R/M will use well-defined systems from the City to create valuation, condition and risk scales and systems within the VUEWorks system.

Each Capital Planning Implementation service will provide the target department with the following:

- Two days on-site w/ R/M implementation team
- Department specific implementation and configuration
- Fully functional inspection reports within VUEWorks that are configured and ready for daily use
- Reports configured and ready for daily use

Workshops for Capital Planning Implementation

Workshop 6-1: Valuation System Definition (Onsite – ½ Day)

Implementing the Valuation modules of VUEWorks requires identification of the GIS attributes for populating valuation, as well as the creation of valuation tables for each year of asset installation to be accounted for. R/M will populate the valuation tables with compiled yearly costs data or for each decade to be accounted for each asset. Valuation will be the basis for budget forecasting and life cycle analysis.

Prior to Workshop 6-1, City staff will staff will compile asset costing data by year, if available. If no data is available, R/M will populate costing data using industry standard costs for assets, as available. R/M will review the information prior to the workshop and will define the condition scales for these activities as part of Workshop 6-1.

As part of this workshop the City will sign off on the usage of GIS data attributes and the unit prices to be utilized in the generation of the valuation tables.

Workshop 6-2: Risk System Definition (Onsite - ½ Day)

Implementing the Risk modules of VUEWorks requires identification of critical asset attributes and conditions as well as critical facilities within each asset system. R/M will work with City staff to create a risk scale for each asset class and classify assets by risk. This classification will be done on a system-wide scale based on key criteria, not on a case-by-case basis per individual asset. R/M will populate the risk data for these assets based on the risk scales determined as part of this workshop. The asset Risk attributes will be incorporated into budget forecasting and capital planning.

As part of this workshop the City will sign off on the risk scales and risk assignments for the system assets.

Workshop 6-3: Condition System Definition (Onsite - ½ Day)

Implementing the Condition modules of VUEWorks requires identification of the condition and rating systems used by the City for tracking and managing their assets. Condition inspection is one of the most basic forms of asset management, and provides the basis for preventive maintenance management, reporting, and analysis.

Prior to Workshop 6-3, City staff will identify 2 well understood condition/rating systems specific to Department assets. Any supporting documents such as paper-based condition reports; inspection forms, rating scales, etc. will be provided to R/M via email. R/M will review the information prior to the workshop and will define the condition scales for these activities as part of Workshop 6-3. R/M will review the City's inspection reports, and work with City staff to determine how to configure these inspection forms and condition systems within VUEWorks prior to Workshop 6-4.

Workshop 6-4: Final Condition Configuration Review (Onsite – ½ Day)

During this workshop, the condition scales and inspection reports created by the R/M Implementation staff within VUEWorks will be reviewed by City staff within the VUEWorks staff.

As part of this workshop the City will sign off on the condition inspection specification and condition systems, as well as the Final configuration of the condition inspection Forms reviewed in Workshop 6-3.

Staff will walk through condition inspection activities from start to finish, and review how the process will be completed in VUEWorks. City staff will create live inspection forms within the system

During this workshop, the SME(s) and VUEWorks Administrator will be exposed to the actual condition modules in VUEWorks to begin creating and modifying condition inspection forms and systems. Asset relations for Condition Inspection forms will be created in VUEWorks, and condition report management within VUEWorks will be reviewed.

Upon completion of this workshop, the VUEWorks Administrator will be able to modify the existing condition scale configuration (both the workflow and the content of the actual condition inspection forms) that the implementation team created within the VUEWorks system. The VUEWorks Administrator will also be capable of creating reports.

Workshop 6-5: Budget Forecasting Workshop (Onsite – ½ Day)

Implementing the Valuation modules of VUEWorks requires identification of the GIS attributes for populating valuation, as well as the creation of valuation tables for each year of asset installation to be accounted for. R/M will populate the valuation tables with compiled yearly

costs data or for each decade to be accounted for each asset. Valuation will be the basis for budget forecasting and life cycle analysis.

Prior to Workshop 6-5, City staff will staff will compile asset costing data by year, if available. If no data is available, R/M will populate costing data using industry standard costs for assets, as available. R/M will review the information prior to the workshop and will define the condition scales for these activities as part of Workshop 6-5.

TASK 7: ADMINISTRATOR TRAINING

The VUEWorks Administrator, and appropriate SMEs designated by the City, will be trained to complete all software configuration necessary to independently maintain and update the data, forms, and processes within VUEWorks. Training will include the following:

- Review Home Page setup
- Review Asset Classes and Types
- Review Configuring Layers and Attribute Tables
- Review Interacting with Map, Selecting and Searching for Assets
- Review Document Linking features and options
- Review Data Linking
- Review Customization Tools for Service Call and Work Order Forms, and Report Manager
- Review Resource Manager module, include Labor, Equipment, and Inventory tables
- Review Facilities Module
- Review Capital Planning Modules
- Review WorkOrderVUE Mobile Application
- Review FacilityVUE Mobile Application
- Assist with Creating & Configuring a Service Call Form and Routing to Appropriate Department/Personnel
- Assist with Creating & Configuring a Work Order Form and Routing to Appropriate Department/Personnel

TASK 8: USER TRAINING

Each training session will be scheduled on a single day. Training is intended for staff that will use VUEWorks modules on a daily basis and are responsible for creating and responding to Service Requests, assigning and filling out Work Orders and preparing reports.

Modules: Core, Service Request, Work Orders, Resource Manager

- Software Overview
- Review Interacting with Map
- Searching
- Selecting Assets
- User Preferences
- Review Service Request module

- Creating Service Request
- Notifications and Routing to Appropriate Department/Personnel
- Responding to Service Request
- Finding Service Requests
- Review Work Order module
- Creating Work Order
- Responding to Work Orders
- Finding Work Orders
- Review Document Linking
- Generating Reports

Modules: Condition

- Creating Condition Forms
- Condition Calculations
- Defining Condition Criteria & Categories
- Reviewing Condition Scales and Rating Options
- Review Criteria Weighting Options
- Creating Condition Inspections
- Generating Condition Reports
- Searching Assets

The City will provide a training facility equipped with a large screen, projector, internet connections, and computers available for up to 8 trainees. The VUEWorks instructor will provide their own laptop.

TASK 9: DATA CONVERSION (AS NEEDED)

In the event that data should need to be converted, R/M will charge time and materials (T&M) to take existing City data and format it as necessary. This may include (but is not limited to) converting existing historical GIS-based work orders into VUEWorks work orders, exporting pictures or documents from the City's existing GIS into VUEWorks, and converting historical maintenance or cost data from City systems into data that can be read by VUEWorks or other R/M based databases.

Should the City decide to have R/M convert data, the City would be responsible for maintaining backups of the original data in the event they would need to access this data in the future. Additionally, there may be instances where not all data can be reasonably converted or imported, in which case R/M will work with the City to determine how best to move forward taking into account the City's priorities, timeline, and budget. Options include (but are not limited to) leaving non-convertible data in its existing system, converting as many historical records as possible within the City's budget/time constraints, or converting only the critical historical data that would be of highest priority for the City. The City would be responsible for maintain backups of the original data, as well as any unconverted data in the event they would need to access this data in the future.

ATTACHMENT B

CITY OF SHEBOYGAN, WI
ASSET MANAGEMENT IMPLEMENTATION PROJECT APPROACH

CITY OF SHEBOYGAN ASSET MANAGEMENT APPROACH AND GOALS

The City of Sheboygan owns a large collection of infrastructure systems that serves almost 50,000 residents. Managing these systems and maintaining continual service to residents involves a major investment of City staff time and funding. The City has selected VUEWorks as its enterprise asset management (EAM) program: to help understand City operations; to best utilize City staff time; and make more informed decisions during infrastructure planning to maximize the value gained from the funding available for infrastructure rehabilitation and replacement.

The Public Works staff includes approximately 80 staff that operate and maintain these systems, and the work that each person does can vary from day to day or from one minute to the next. VUEWorks will help the City better understand the complex combination of work being completed by the Public Works staff in order to better manage their operations. This knowledge will also help the City identify trends and issues with their assets to be more strategic about their maintenance operations.

Ruekert & Mielke, Inc. (R/M) understands that there are five key goals for Public Works:

- Transition operations from a reactive approach to a proactive, preventative approach to allow for more maintenance and less asset failures
- Recommendation of Best Practices within each department for regular asset operations and maintenance.
- Identify key performance indicators (KPI's) across departments to allow for the measurement of progress and performance.
- Determine how staff time is being utilized to identify efficiencies and opportunities.
- Generate reports and dashboards to summarize and track the progress of staff activities across Departments, that would be accessible to key City management staff.

The City is also responsible for the rehabilitation and replacement of their infrastructure systems. VUEWorks will allow the City to incorporate the Value, Condition, Risk, and operational history for the City assets. This will enable City staff to be far more strategic about their capital planning process. VUEWorks will also allow the calculation of the full life-cycle cost of an asset, which can be determined by incorporating the operational and maintenance costs incurred through Public Works operations.

R/M understands that there are three key City goals for Capital Planning:

- Utilize the City's GIS system to determine Value for their major asset classes.
- Incorporate Asset Condition and Risk to help prioritize asset replacement strategies.
- Calculate the life cycle costs for assets to compare the cost of ownership vs. replacement.

The City desires a successful EAM implementation, to be completed within the next two years. The City will need the R/M implementation project team to coordinate with City staff to keep the project moving forward on schedule, and they will need to work with City staff to determine the appropriate involvement and progress from Public Works staff.

R/M's understanding is that there are three key City goals for the VUEWorks Implementation:

- The VUEWorks implementation needs to be completed within two years.
- The R/M team needs to work with City management to ensure that City staff and resources are allocated as necessary for successful implementation
- Adoption of the VUEWorks software by Public Works staff will be critical and will require support from critical staff within each Department, in addition to City management staff and the implementation project team.

R/M Implementation Approach

As a community that is looking to transition into an EAM program, the City is going to experience a major operational change for its staff. These staff have been working with established processes and procedures that they have used for years to do their jobs. An EAM will require them to integrate digital data entry and recording into their regular activities. This new effort will require a change to how they do things, but is necessary with any major operational transition.

R/M's approach to implementation is to work within the framework of how your staff operate today and configure the VUEWorks software to align with the processes and structure within your departments. We will conduct workshops with each department to determine how staff work today. We will meet with your department supervisors and critical department staff to find out what they do and how they do it. This helps us better understand how they work and allows them to provide the input and information that will be used to configure the VUEWorks software.

We will identify existing workflows from when a resident calls with an issue until the work is completed. We will map out the different activities that the department staff complete, who does this work, and how these activities are related. R/M will then work with your staff to map out the processes within each department and provide a department workflow process diagram and a workflow map that identifies and classifies each request and work order that the department handles. Through this process, there will typically be some standardization and alignment of workflows that occurs within and between different departments.

Mapping out your processes and activities is critical to the proper configuration, to easing the transition from your staff, and for getting buy-in from your critical department staff and supervisors. The VUEWorks software will be tracking and recording your operations, and we feel that it should be configured to your workflows and processes.

Project Management

R/M will be managing the implementation project from start to finish. Our team will be coordinating with City staff throughout the project for scheduling of meetings and workshops, configuration workflows, and testing and utilizing the VUEWorks software. We will be identifying the critical City staff for the overall implementation process, as well as critical staff within each department, and engaging with them during the workshops, throughout the configuration and testing process, and into the live usage of the VUEWorks site.

Kevin Wagner is an experienced VUEWorks implementer for R/M and will be the R/M project lead throughout this implementation. He will be present at all of the project workshops with each department. Kevin will be the main point of contact for the City as well as DTS, and will be managing the DTS configuration and integration work that is being completed. Kevin will be providing progress updates at each monthly meeting, including an assessment of where additional City resources or staff time may be required to stay on schedule for each Task in the project.

Project Schedule and Staging

We are proposing a 3-phase approach to the VUEWorks implementation process. Phase 1 would take place from October of 2021 through January of 2022, Phase 2 would take place from January of 2022 through April of 2022, and Phase 3 would take place from October of 2022 through April of 2023.

The 1st phase would focus on work management for the operations of streets and sewers in the Streets and Sanitation Department, as well as operations in the Forestry and Parks Department.

The 2nd phase would tentatively focus on work management for the operations of sanitation in the Streets and Sanitation Department, as well as operations in the Facilities and Traffic Department. It would also focus on capital planning functionality for Streets, Sewer, Parks and Trees.

The 3rd Phase would tentatively focus on work management for the operations of the Engineering Department, and the Vehicles and Equipment Department and the Wastewater Treatment Department. It would also focus on capital planning functionality for Facilities and Traffic Appurtenances.

Capital planning functionality for Wastewater Treatment and Vehicles and Equipment would be incorporated after Phase 3 as appropriate.

R/M will hold monthly progress meeting with the City Management Team to provide status updates of the implementation process by Department, a proposed schedule for the next two months, including workshops, meetings, and staff responsibilities.

Best Practices and Standards

During the implementation workshops, our team will identify and recommend best management practices that have been successful in other communities we have worked with or are industry standards. This will focus primarily on preventative maintenance, asset inspections and the incorporation of Key Performance Indicators (KPI's) to track progress and performance.

Documentation and Deliverables

R/M will be providing documentation throughout the implementation process. This documentation will establish the basis of the VUEWorks software configuration, and can be utilized by City staff for standards, procedures and training purposes.

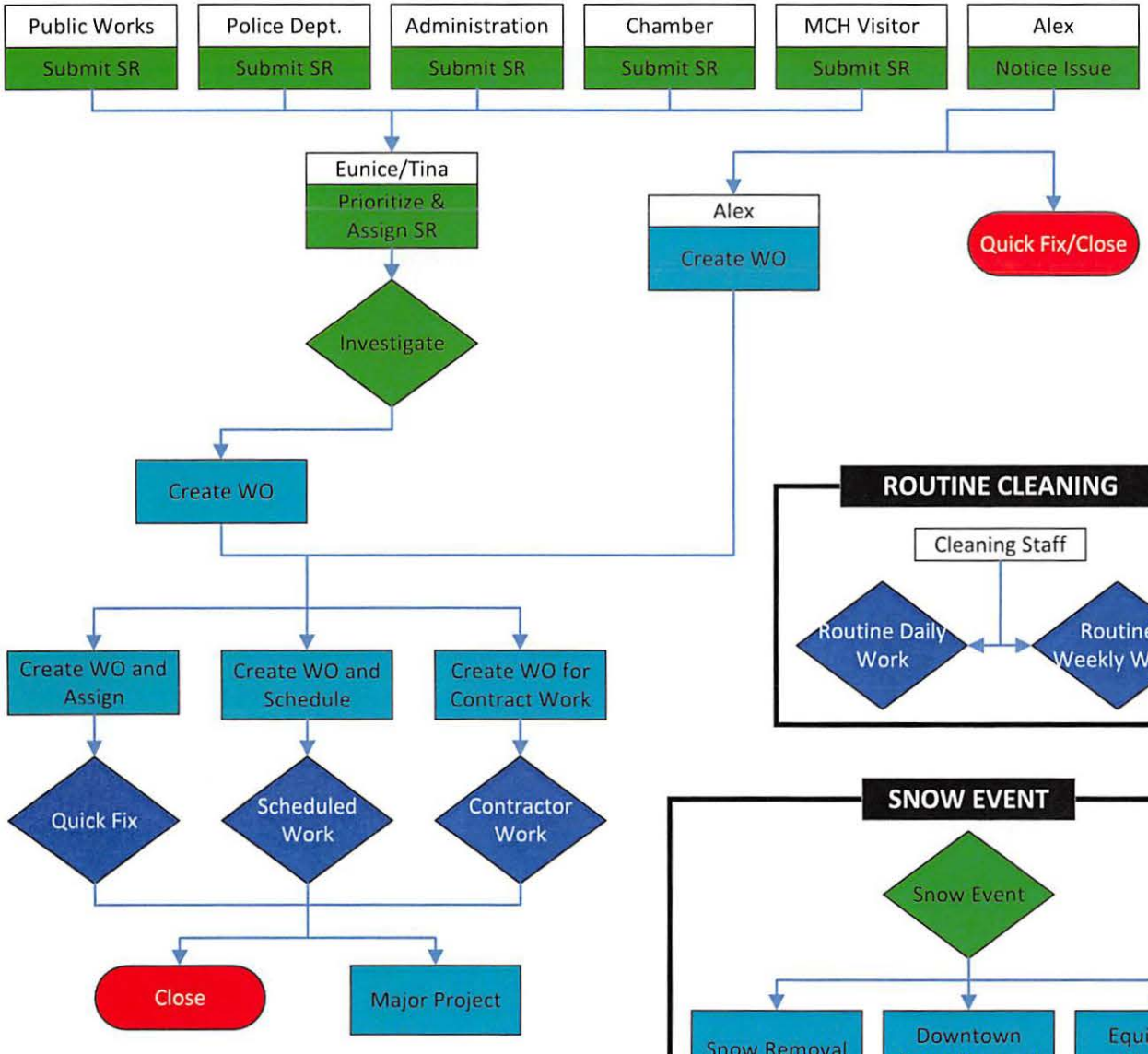
The following documentation and deliverables will be provided for each Department:

- A **Process Workflow Diagram** laying out processes and responsibilities for workflow. See Exhibit 2 for an example Workflow Diagram document.
- A **Department Workflow Map** for identifying service requests and work orders and how they are related. See Exhibit 3 for an example Workflow Map document.
- A **VUEWorks Standard Operating Procedures** for data entry into VUEWorks for the Department

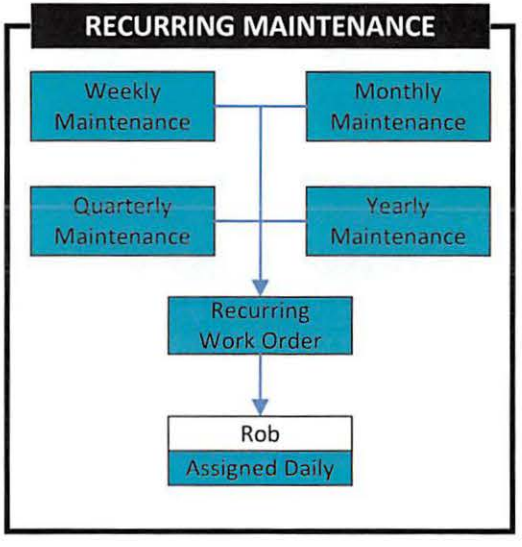
The following documentation and deliverables will be provided for the project as a whole

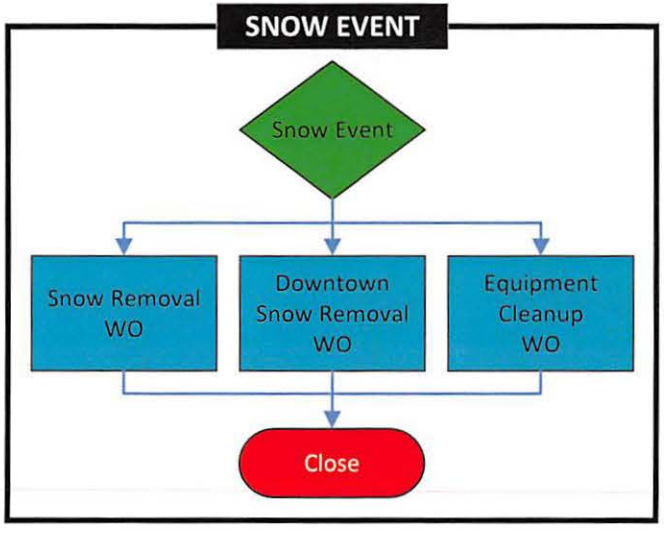
- A **Recommendation of Best Practices** identifying the relevant departments and related assets as appropriate.
- A **Project Implementation Schedule** that will be updated for each monthly progress meeting and will document progress as it occurs. See Exhibit 4 for a sample Project Schedule.
- A **Capital Planning Data Register** that will document the relevant GIS data for each major asset that will be utilized in VUEWorks detailing the key attributes to be used for each asset and the quality and status of data for those attributes.
- An **Asset Management Operations Overview** that outlines the metric and KPI's to be used for the City's operations by Department, and as a whole.

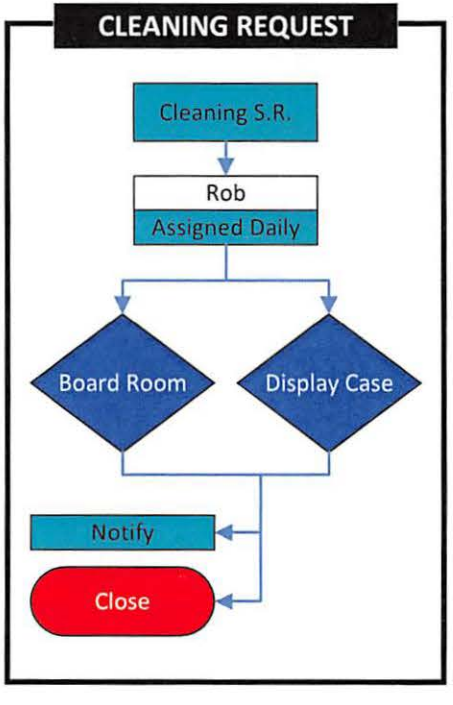
SAMPLE WORKFLOW DIAGRAM – BUILDINGS & GROUNDS – Workshop 2: Workflow Identification and Classification

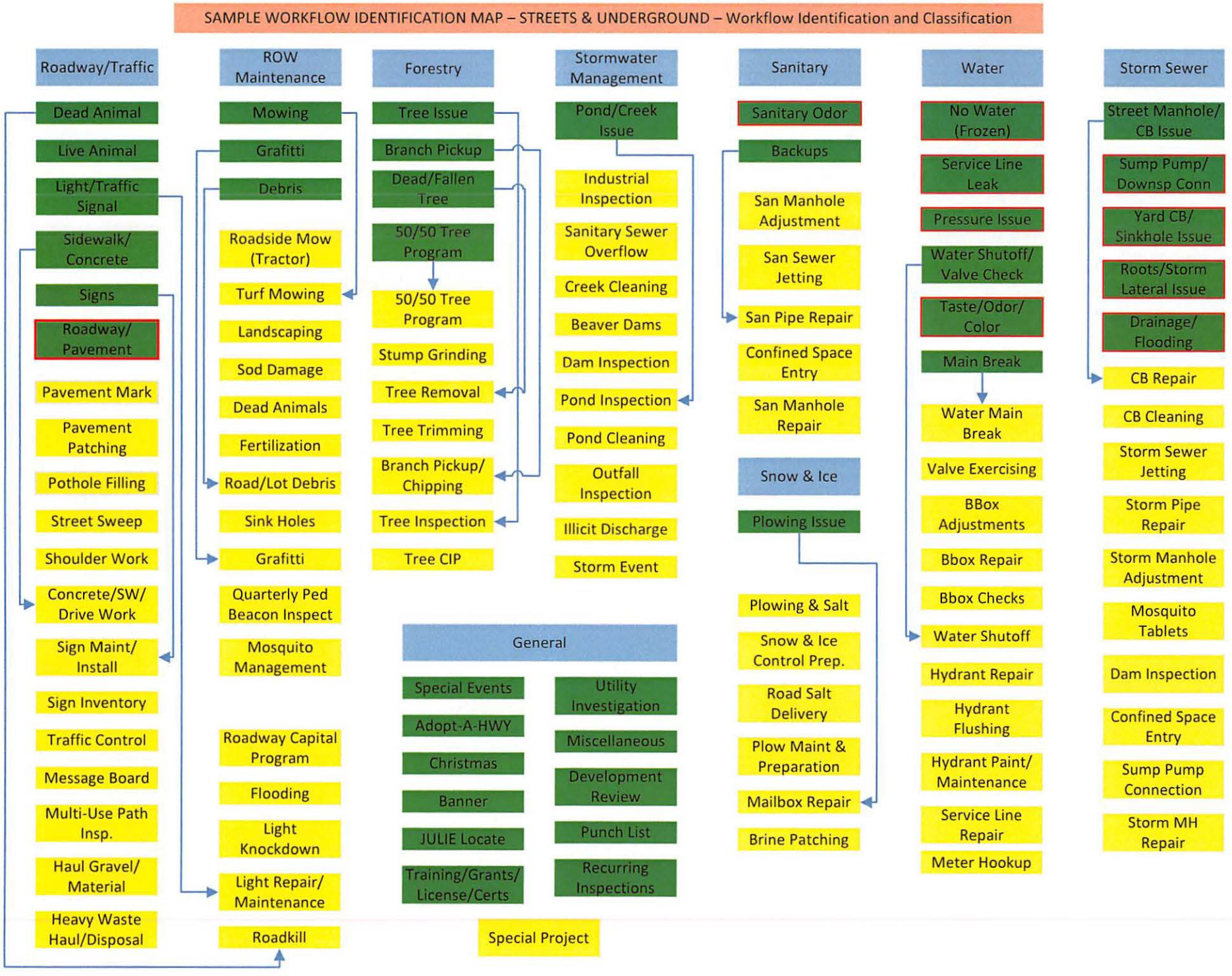










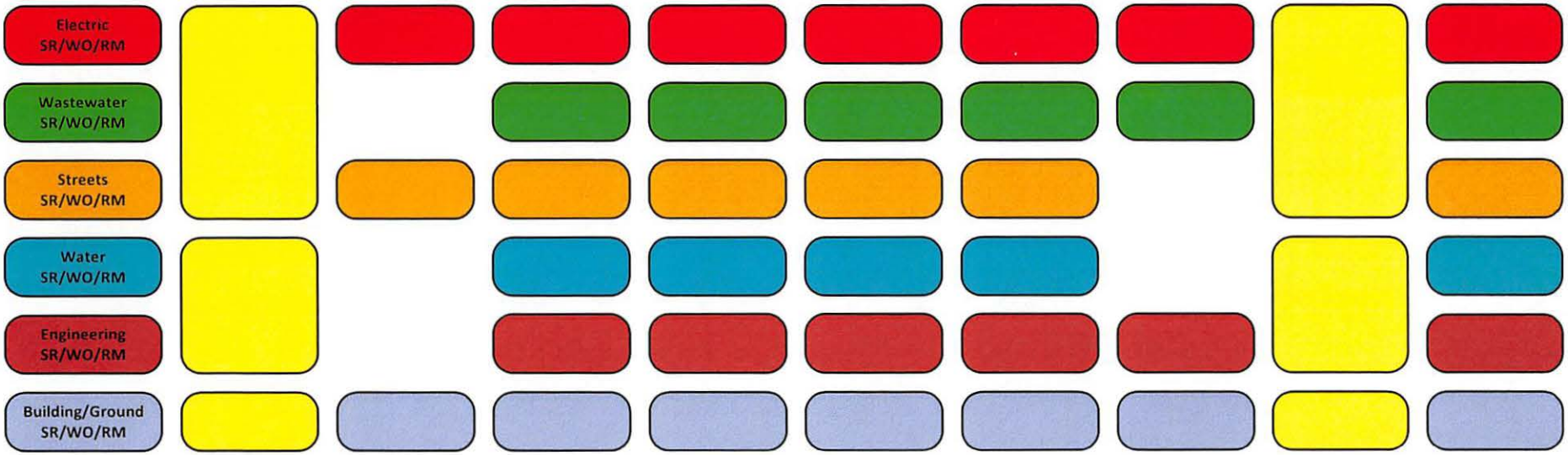

SAMPLE WORKFLOW IDENTIFICATION MAP – STREETS & UNDERGROUND – Workflow Identification and Classification
Roadway/Traffic
Dead Animal
Live Animal
Light/Traffic Signal
Sidewalk/ Concrete
Signs
Roadway/ Pavement
Pavement Mark
Pavement Patching
Pothole Filling
Street Sweep
Shoulder Work
Concrete/SW/ Drive Work
Sign Maint/ Install
Sign Inventory
Traffic Control
Message Board
Multi-Use Path Insp.
Haul Gravel/ Material
Heavy Waste Haul/Disposal
ROW Maintenance
Mowing
Grafitti
Debris
Roadside Mow (Tractor)
Turf Mowing
Landscaping
Sod Damage
Dead Animals
Fertilization
Road/Lot Debris
Sink Holes
Grafitti
Quarterly Ped Beacon Inspect
Mosquito Management
Roadway Capital Program
Flooding
Light Knockdown
Light Repair/ Maintenance
Roadkill
Forestry
Tree Issue
Branch Pickup
Dead/Fallen Tree
50/50 Tree Program
50/50 Tree Program
Stump Grinding
Tree Removal
Tree Trimming
Branch Pickup/ Chipping
Tree Inspection
Tree CIP
Stormwater Management
Pond/Creek Issue
Industrial Inspection
Sanitary Sewer Overflow
Creek Cleaning
Beaver Dams
Dam Inspection
Pond Inspection
Pond Cleaning
Outfall Inspection
Illicit Discharge
Storm Event
Sanitary
Sanitary Odor
Backups
San Manhole Adjustment
San Sewer Jetting
San Pipe Repair
Confined Space Entry
San Manhole Repair
Snow & Ice
Plowing Issue
Plowing & Salt
Snow & Ice Control Prep.
Road Salt Delivery
Plow Maint & Preparation
Mailbox Repair
Brine Patching
Water
No Water (Frozen)
Service Line Leak
Pressure Issue
Water Shutoff/ Valve Check
Taste/Odor/ Color
Main Break
Water Main Break
Valve Exercising
BBox Adjustments
Bbox Repair
Bbox Checks
Water Shutoff
Hydrant Repair
Hydrant Flushing
Hydrant Paint/ Maintenance
Service Line Repair
Meter Hookup
Storm Sewer
Street Manhole/ CB Issue
Sump Pump/ Downsp Conn
Yard CB/ Sinkhole Issue
Roots/Storm Lateral Issue
Drainage/ Flooding
CB Repair
CB Cleaning
Storm Sewer Jetting
Storm Pipe Repair
Storm Manhole Adjustment
Mosquito Tablets
Dam Inspection
Confined Space Entry
Sump Pump Connection
Storm MH Repair
General
Special Events
Adopt-A-HWY
Christmas
Banner
JULIE Locate
Training/Grants/ License/Certs
Utility Investigation
Miscellaneous
Development Review
Punch List
Recurring Inspections
Special Project

SAMPLE IMPLEMENTATION SCHEDULE

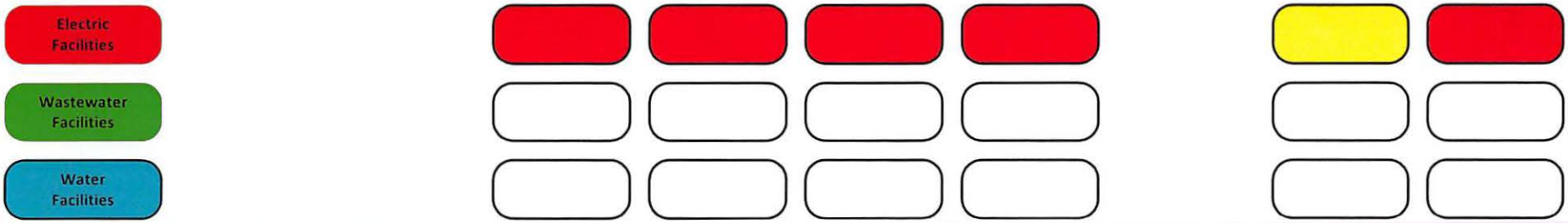
March 2019

Kickoff Meeting	Needs Assessment	Workflow Definition	Workflow WS	Config WS	Workflow WS	Separate Report WS	Admin Training	User Training
4 hours	2 hours	4 hours	Onsite (2 days)	4 hours	Onsite (2 days)	Onsite (1 day)	Onsite (2 days)	Onsite (1 day)

Service Request, Work Orders & Resource Manager



Facilities



Ruekert · Mielke

ATTACHMENT C - HOSTING

1. Software.

1.1 Hosting. Consultant shall host the VUEWorks Software ("Hosted Software") for the benefit of Client on servers owned, controlled, leased or licensed by Consultant. Client is responsible for maintaining the security and confidentiality of all usernames and passwords used to access the Hosted Software. Client is solely responsible for connection of Client's systems to a telecommunications service that provides Internet access for purposes of Client's access and use of the Hosted Software. For the avoidance of doubt, Consultant may suspend Client's access to the Hosted Software and the Client Data if Client is past due in making any payments for undisputed invoices due hereunder, but will provide reasonable notice to Client before doing so. Client shall pay to Consultant the fees set forth in Exhibit 1 – Schedule of Costs and Invoicing, of the Agreement.

1.2 Availability of Services.

a. *Uptime Commitment.* Consultant offers a performance commitment that the key features of the Hosted Software will be available for access and use by Client at least 98% of the time per calendar year, excluding any period of Permitted Unavailability (the "Uptime Commitment"). Absent unusual circumstances, Consultant shall schedule Planned Outages during non-peak hours. The Uptime Commitment are subject to the terms of this Section.

b. *Procedure.* When a period of unavailability is detected by Client, Client shall promptly contact Consultant by email or phone and advise Consultants' staff of the problem.

c. *Limitations.* Consultant is not responsible for periods of unavailability resulting from failure by Client to make or approve reasonable modifications to the Software or the Hosted Software recommended by Consultant to prevent periods of unavailability. In addition, Consultant will not be responsible for periods of unavailability resulting from any of the following: (i) Client modifications to or uses of the Software or Hosted Software that are not authorized by VUEWorks or Consultant or permitted under this Agreement, (ii) Permitted Unavailability (iii) Client errors in integration, (iv) or Data Transfer Solutions licensing and/or software issues or limitations, which are covered in a separate agreement.

d. *Monitoring.* Consultant does not guarantee that remote monitoring will detect all problems or interruptions at the time they occur.

1.3 Customer Data; Indemnity. Client grants Consultant the right to use, display, copy, distribute, and make derivative works of Client Data for purposes of enabling Consultant to offer and perform its services to Client and fulfill its obligations to Client and for no other purpose. Client represents and warrants that (a) it has obtained all rights, consents, and permissions necessary to input the Client Data into the Software and to grant the foregoing rights to Consultant, (b) Client's use, copying, displaying, and distribution of the Client Data complies with all federal, state, and/or local laws, rules, regulations and/or ordinances and the terms and policies (including terms of use and privacy and security policies) of all websites from which the Client Data originated and all websites to which the Client Data is copied, distributed, displayed, or published using the Software, and (c) the Client Data shall not include any personally identifiable healthcare data or financial data of any individual and/or any other data violative of third party rights and/or any applicable law, and/or any data relating to any person under the age of thirteen (13) years. Client shall indemnify, defend, and hold harmless Consultant and its affiliates and subsidiaries and their respective officers, directors, employees, members, representatives, and agents from and against any and all claims, losses, liability, damages, costs, and expenses (including reasonable out-of- pocket expenses and attorneys' fees) arising out of or relating to Client's breach of the foregoing representations and warranties. Consultant may refuse to distribute or publish, and may remove, any Client Data that Consultant determines to be in violation of the foregoing representations and warranties. Consultant may combine the Client Data with other information it gathers, develops, or licenses from others in offering and performing its services and fulfilling its obligations, for purposes of improving the Software, and for purposes of establishing and/or developing customer usage benchmarks and studies. Consultant may not use Client's name and/or logo in conjunction with the establishment or development of benchmarks and studies nor publish any of Client's data entered into the system without the express written permission of the Client.

1.4 Suspension of Access to Hosted Software. Consultant may suspend Client's access to the Hosted Software (in whole or in part) for any of the following reasons: (a) to prevent damages to, or degradation of, the Hosted Software or Consultants' systems; (b) to comply with any law, court order, or other governmental request; (c) to otherwise protect Consultant from potential legal liability; (d) if Client violates the terms of this Agreement and fails to remedy such breach within the time frame set forth herein. Consultant shall provide Client with notice before or if not possible beforehand promptly following any suspension of access to the Hosted Software. Consultant shall restore access to the Hosted Software as soon as the event giving rise to suspension has been resolved in accordance with the Client's obligations under law, court order or the terms of this Agreement. Section 1.3 is not to be construed as imposing any obligation or duty on Consultant to monitor Client's use of the Hosted Software or the Client Data or other content uploaded by Client and/or its customers.

1.5 Technical Support and Software Maintenance. Provided Client has made all required payments of undisputed invoices hereunder, Consultant shall provide technical support for the Hosted Software in accordance with Consultant's technical support policies ("Technical Support") and Attachment D (Technical Support and Software Maintenance) attached below. Provided Client has purchased maintenance from Consultant, and Client has paid all amounts due, Consultant will perform maintenance with respect to the Software (including the Hosted Software) in accordance with Consultant's maintenance policies ("Maintenance"). Consultant services included in the cost of the Annual VUEWorks Maintenance and Support (Exhibit 1) are laid out in Attachment D. Additional technical or support services that are not covered under the annual Vueworks Maintenance and Support may be requested. Consultant shall invoice Client for such requested services at its then current data maintenance rates (Additional Support Services).

2. Feedback.

Client may provide suggestions, comments, or other feedback (collectively, "Feedback") to Consultant with respect to its offerings and services, including the Software. Feedback is voluntary and Consultant is not required to hold it in confidence. Consultant may use Feedback for marketing and development purposes, but Consultant may not use Client's name or logo in any publication, marketing materials or for any other purpose other than performing the services pursuant to this Agreement without express written permission of Client.

3. Client Data Maintenance.

3.1 GIS Data Hosting

To the extent that Client selects the Hosted Software, Client shall deliver to Consultant Client Data, including GIS Data, in a format specified by Consultant. Consultant shall present the GIS Data using symbols and line types determined by Consultant. Consultant may require that Client host video data on Client servers or online, and Consultant would provide links to that data within the software.

3.2 Additional Data Maintenance

Client may request that Consultant provide services to update Client Data including GIS Data so long as Consultant continues to provide the Hosted Software. Consultant shall invoice Client for such requested services at its then current data maintenance rates ("Data Maintenance").

4. Term and Renewal. The initial term of this Agreement commences on the Effective Date and shall continue for five (5) years from the first day of the month from the Effective Date unless terminated earlier in accordance with the terms of this Agreement, with one (1) three (3) year renewal period available at the end of the initial five (5) year term. Consultant will not increase the annual fee applicable during the initial five (5) year term or the subsequent optional three (3) year renewal. In the event the Client chooses to renew for one (1) year, the new annual fee shall not exceed more than a 3% increase from the prior in-force term. Subsequent renewals shall follow the same renewal conditions.

5. Fees and Payment. Customer shall pay Consultant the fees for the Software Implementation, Software Hosting along with the fees for Technical Support, Maintenance and, if applicable, Data Maintenance as outlined in the Schedule of Costs and Invoicing (Exhibit 1). Payment by the Client of undisputed invoices

shall be due within sixty (60) days of presentation of Consultant's invoice. If Client believes that an invoice is incorrect or otherwise disputes the invoice and Client desires to obtain an adjustment of such invoice, Client must provide Consultant notice thereof including relevant details within thirty (30) days of the invoice date. Client is responsible for sales, use, and similar taxes associated with its receipt and use of Software, including the Hosted Software, Technical Support, Maintenance and Data Maintenance.

6. Confidentiality. As used herein, "Disclosing Party" and "Recipient" refer respectively to the party which discloses information and the party to which information is disclosed in a given exchange. Either Consultant or Client may be deemed Disclosing Party or Recipient depending on the circumstances of a particular communication or transfer of information. Recipient will hold the Confidential Information of the Disclosing Party in confidence, using the same degree of care that it uses to protect its own information of similar importance, but will in any case use no less than a reasonable degree of care to protect Confidential Information. Recipient will not directly or indirectly disclose Confidential Information or any part thereof to any third party (who is not an authorized employee or agent of the receiving party) without Disclosing Party's advance express written authorization to do so. Recipient may disclose Confidential Information only to its employees or agents in the normal course of its business and only on a need-to-know basis. Additionally, a party will not be prohibited from disclosing the Confidential Information to the extent required by applicable law, statute, rule, regulation, or regulatory or administrative body. In the event Client receives a public records request or similar request – such as a subpoena – for confidential information, Client shall promptly notify Consultant at VUEWorksSupport@ruekert-mielke.com. VUEWORKS may provide guidance to Client, but this is handled under a separate agreement. In the event Consultant receives a subpoena or similar request for confidential information, Consultant shall promptly notify Client at david.biebel@sheboyganwi.gov and shall, to the extent permissible by law, allow the Client to provide guidance as to whether the information is protected from disclosure under Wisconsin law and allow the Client to seek a restraining order or other appropriate relief. Each party acknowledges that the other party will suffer irreparable injury as a result of any misuse, disclosure or duplication of its Confidential Information by the other party in violation of this clause. Accordingly, the injured party shall be entitled in such event to seek injunctive relief, without proving actual damage or posting a bond or other security, in addition to any other applicable remedies, including the recovery of damages. Such party shall be entitled to recover its costs and fees, including reasonable attorneys' fees, incurred in obtaining such relief. The non-breaching party may immediately terminate this Agreement upon notice to the other party for any breach of that party's obligation set forth in this Section.

8. Hosting Warranty. Consultant warrants that it will host Client on a database which is inaccessible to other customers of the Cloud Hosting service, that it will maintain regular data backups (15 minute backups up to one week, daily data backups up to one weeks, weekly data backups up to six months and monthly backups up to three years), and that it will provide secure data transmission paths from each of Client's work stations to Consultant's services.

9. Certain Definitions. As used in this Agreement, the terms below when capitalized have the following meanings:

"**Confidential Information**" means nonpublic information that a reasonable person would believe to be confidential and includes, without limitation, personal identifying information and trade secrets, each as defined by applicable state law. For the avoidance of doubt, this Agreement and its attachments (including the pricing information) is not Confidential Information. "Confidential Information" does not include information that (a) is or becomes generally known to the public or made available on the Internet at any time by any means other than a breach of the obligations under this Agreement of a receiving party; (b) was received by the receiving party from a third party who had a lawful right without restriction to disclose such information; (c) is independently developed by the receiving party without any use of or reliance on any Confidential Information; or (d) the receiving party lawfully had knowledge of, or access to, prior to the time of disclosure by the disclosing party.

"Client Data" means GIS Data, VUEWORKS' database files, Client's data base files, and all other electronic content and data stored on Consultant's computers for use by Client with the Hosted Software. Amount of Client Data to be stored shall be measured in bytes and be limited to 500 Gigabytes of space. Procedures by which Client may store and access Client Data via Consultant's servers shall be limited to the use of the Hosted Software. Client acknowledges that Consultant shall have no obligation to return to Client any Client Data if Client has not paid all amounts due hereunder or does not comply with the

notice procedure with respect to the return of Client Data set forth in Section 5.

"GIS Data" means spatial data as part of a geographic information system data.

"**Permitted Unavailability**" means unavailability of the Hosted Software due to Planned Outages, a force majeure event (as provided in Article 24 of the Agreement), any software, hardware, or telecommunication or digital transmission failures or interruptions, Internet slow-downs or failures, third party software, hardware, or service failures, or any actions or inactions of Client or Client's vendors or service providers, that prevents, limits, or degrades the availability or use of some or all of the Hosted Software.

"**Planned Outages**" means the period of time during which Consultant or VUEWORKS conducts standard systems maintenance.

"**Software**" means the VUEWORKS' software listed in Attachments A, B, C and D and on Exhibit 1, and this may be Hosted Software. VUEWORKS may in its sole discretion update or make changes to the functionality of the Software from time to time.

10. General Provisions.

10.1 Notices. Except as expressly provided by this Agreement, any notice, request, instruction, or other communication required or permitted to be given under this Agreement shall be in writing (collectively, "Notices"), delivered to the addresses first set forth above, to the attention of Kevin Wagner with respect to Consultant, and to the attention of the City Clerk, with respect to Client. Copies of all Notices to Consultant shall also be delivered to Ruekert & Mielke, Inc. 1400 Lombardi Avenue Suite 101S, Green Bay, Wisconsin, 54304, Attention: Kevin Wagner. All such Notices shall be effectively given: (i) upon personal delivery to the party to be notified; or (ii) upon receipt when delivered by a nationally recognized overnight courier, with written verification of receipt; or (iii) upon receipt as indicated by the date on the signed receipt when delivered by registered or certified mail, return receipt requested and postage prepaid; or (iv) if the party to which it is addressed rejects or otherwise refuses to accept it, or if it cannot be delivered because of a change in address for which no notice was given, then upon that rejection, refusal, or inability to deliver. The parties may change their respective addresses for which Notices shall be received upon compliance with the terms of this Section.

10.2 No Third Party Beneficiaries. Nothing contained in this Agreement shall create a contractual relationship with, or a cause of action in favor of, any third party. It is expressly understood and agreed that the enforcement of these items and conditions shall be reserved to the Client and Consultant. Nothing contained in this Agreement shall give or allow any claim or right of action whatsoever by any third person. It is the express intent of the Client and Consultant that any such person or entity, other than the Client and Consultant, receiving services or benefits under this Agreement shall be deemed an incidental beneficiary.

10.3 Headings. The descriptive headings of the sections and subsections of this Agreement are for convenience of reference only. They do not constitute a part of this Agreement and do not affect this Agreement's construction or interpretation.

10.4 Publicity. Neither party shall use the other party's name or logo, or refer to the other party directly or indirectly in any media release, public announcement, or public disclosure relating to this Agreement or its subject matter, including any promotional or marketing materials, lists, referral lists, or business presentations, without written consent from the other party for each such use or release. Consultant expressly consents to Client taking the steps necessary to obtain approval of this Agreement from City's Common Council, including, to the extent Client deems necessary, referring to Consultant and the contents of this Agreement. Such approval will not be unreasonably withheld.

10.5 Counterparts. If the parties sign this Agreement in counterparts, each counterpart constitutes an original, and all counterparts, collectively, constitute only one agreement. The signatures of all the parties need not appear on the same counterpart, and delivery of a signed counterpart signature

page by fax or other electronic transmission is as effective as signing and delivering an original.

ATTACHMENT D – TECHNICAL SUPPORT & SOFTWARE MAINTENANCE

1. Ruekert & Mielke Inc. VUEWorks technical support is available from 8:00am to 4:00pm, Central Time, on all weekdays other than Federal holidays, the day after thanksgiving, and the days between (and including) Christmas Eve and New Years Eve. VUEWorks support includes answering questions from Client over the telephone or e-mail, and the commercially reasonable effort to have the VUEWorks Software functioning properly in accordance with the documented product features and specifications.
2. VUEWorks Support must be initiated either through calling our office line (262) 542-5733 or Support Email: VUEWorksSupport@Ruekert-Mielke.com. Ruekert & Mielke Inc. recommends the use of email as it serves as a written record of the event.
3. Client shall designate one individual to serve as the primary support contact for requests. Additionally, Client may designate as many as two (2) more secondary individuals who may contact Ruekert & Mielke Inc. directly for support issues. Other arrangements will be addressed on a case by case basis and must be agreed to in writing by Client and Ruekert & Mielke Inc.
4. The initial contact, whether invoked by email or telephone for a particular issue, defines the beginning of a support incident.
5. In cases where a Ruekert & Mielke Inc. staff member is unable to answer the phone, or when the Client uses email for a support request, Client will include in the message their name, their organization, a thorough description of the steps that preceded the problem, and a call back number. Screen shots and complete descriptions of the problem, activities leading to the problem and any related detail are most helpful. Ruekert & Mielke Inc. may not be able to respond if this information is not provided.
6. Common incidents include operational questions, improvement suggestions, problems related to changes in the Client's GIS environment, problems related to changes in the Client's VUEWorks implementation, and problems related to defects in the software.
    a. If the incident involves a defect in the VUEWorks software, Ruekert & Mielke Inc. will work with VUEWorks to provide the commercially reasonable effort to fix the defect(s) at no additional charge.
        i. A defect is defined as an issue with the software during the normal course of operation where the software does not function as documented due to an error in the software code.
        ii. A defect is often, but not always, accompanied by an error message.
        iii. VUEWorks software has many dependencies that could generate error messages that are delivered through VUEWorks but are not VUEWorks software defects. These include but are not limited to:
            1. Esri GIS Software (ArcGIS Server or ArcIMS)
            2. MS SQL Server
            3. Server operating system
            4. Permissions
            5. Hardware
            6. Network connectivity
            7. Individual client computer issues
                a. Individual Client computer issues are identified when the issue occurs on a limited number of computers but not on all computers using the same VUEWorks user login.
    b. VUEWorks and Ruekert & Mielke Inc. reserve the right to determine if an issue is caused by a VUEWorks software defect or not.

7. If the issue is determined to be anything other than a defect in the VUEWorks software code then Ruekert & Mielke Inc. will provide up to 30 minutes of technical support at no charge, followed by a charge of up to one hundred seventy-five ($175) per hour per incident.
8. Ruekert & Mielke Inc. technical services do not include support for Esri Software. While Ruekert & Mielke Inc. staff may attempt, at its sole discretion, to resolve issues stemming from Esri Software, the Client recognizes that these types of issues are best supported through Esri's many support channels.
9. Ruekert & Mielke Inc. handles incident reports in the following manner:
   Each incident logged will be given a priority of 0 to 4 as determined by Ruekert & Mielke Inc. technical support staff. Ruekert & Mielke Inc. will first attempt to resolve the issue with the Client upon initial response. If the issue cannot be resolved during initial response then Ruekert & Mielke Inc. will respond to the request depending on the priority of the issue as defined in the following sections:
   a. Priority 0. Critical Issue. Ruekert & Mielke Inc. will start working on the issue within 4 business hours of initial response and continue to work on the issue during normal business hours until the issue is resolved. Examples of Critical Issues:
      i. No user at the Client site can log on to VUEWorks
      ii. The map does not display on any user computer at the Client's site.
      iii. No user at the Client's site can create a Service Call or Work Order
   b. Priority 1. Severe Issue. Ruekert & Mielke Inc. will start working on the issue within one business day of initial response and continue to work on the issue during normal business hours until the issue is resolved if any of the following occurs:
      i. VUEWorks generates information that is obviously and substantially incorrect
      ii. A feature produces error messages that causes an application feature to stop functioning or not produce results.
   c. Priority 2. Important Issue. If the issue cannot be resolved through the initial response process then Ruekert & Mielke Inc. will start working on the issue within 5 business days if any of the following occurs:
      i. An issue reported by Client that can be resolved byproviding help on using a specific feature
      ii. Issues that cause an error message but do not cause the application to stop functioning or create results that are substantially incorrect
      iii. Issues acknowledged by VUEWorks as a defect that can be avoided without loss of functionality through a work around process
   d. Priority 3. Low priority issues. If the issue cannot be resolved through the initial response process then Ruekert & Mielke Inc. will document the issue but not be obligated to respond within any specific time frame for the following types of issues:
      i. Issues or questions that are not directly related to the functionality of the product
      ii. Non-contractual application enhancement request (the "Wishlist"). A non-contractual request to provide features in VUEWorks that are not in the current product.
   e. Priority 4. Issue is not directly related to VUEWorks software. If an issue is determined to be related to hardware, browser, or operating system malfunction Ruekert & Mielke Inc. will notify Client that the issue must be resolved by the Client. These cases are usually substantiated if the issue occurs on only one user computer and cannot be replicated on another user computer or at Ruekert & Mielke Inc.'s test environment.

   Ruekert & Mielke Inc. will provide commercially reasonable effort based on the above guidelines. If it is determined that the effort required to resolve the issue is not included in this Annual Maintenance and Support policy, work will stop and the Client will be advised that the work is not covered. At Ruekert & Mielke Inc.'s discretion, the Client may be provided an option for Ruekert & Mielke Inc. to continue the work at an agreed to cost and scope.

LICENSE AGREEMENT

This License Agreement (this "**Agreement**") is made and entered into as of _____, 2021 (the "**Effective Date**") between Data Transfer Solutions, LLC, a Florida limited liability company ("**VUEWORKS**"), with place of business at 3680 Avalon Park Boulevard, Suite 200, Orlando, Florida 32828, and the City of Sheboygan, WI a municipal corporation ("**Customer**"), with a place of business at 828 Center Avenue, Sheboygan, WI 53081.

1. **Software**.

1.1 Software License. Subject to the terms of this Agreement and each applicable Order Form, and as long as no payments due for undisputed invoices hereunder are past due, VUEWORKS hereby grants to Customer a perpetual, nonexclusive, non-transferable, non-sublicensable, limited license to install and use the Software, for solely its internal business purposes or municipal purposes in connection with the storage and processing of Customer Data.

1.2 Hosting. To the extent set forth on any Order Form, VUEWORKS shall host the Software for the benefit of Customer on servers owned, controlled, leased or licensed by VUEWORKS ("**Hosted Software**"). Customer is responsible for maintaining the security and confidentiality of all usernames and passwords used to access the Hosted Software. Customer is solely responsible for connection of Customer's systems to a telecommunications service that provides Internet access for purposes of Customer's access and use of the Hosted Software. For the avoidance of doubt, VUEWORKS may suspend Customer's access to the Hosted Software and the Customer Data if Customer is past due in making any payments for undisputed invoices due hereunder, but will provide reasonable notice to Customer before doing so. Customer shall pay to VUEWORKS the fees set forth in Exhibit B – Project Pricing, and shall comply with the terms and conditions set forth in this Agreement.

1.3 Appropriate Use of the Software.

a. *Generally*. When using the Software, Customer shall comply with all applicable laws, rules, regulations, and/or ordinances. Except as expressly authorized by this Agreement, Customer shall not license, sublicense, sell, resell, transfer, assign, distribute or otherwise commercially exploit or permit any third party to access or use the Software. Notwithstanding the foregoing, Customer may permit third party contractors to use the Software to the extent the contractor has been retained to perform work and services as part of Customer's ordinary municipal business such that contractor is performing the same type of work as would be reasonably expected from Customer's employee(s). Such third-party contractor is subject to the same requirements and limitations in its use of the software as a Customer employee. In addition, Customer shall not directly or indirectly (i) decompile, disassemble, or reverse engineer the Software, (ii) use the Software or any Confidential Information to develop a competing service, (iii) provide, lease, lend, use for timesharing or service bureau purposes, or otherwise use or allow others to use the Software for the benefit of any third party, (iv) remove any copyright, trademark, proprietary rights, disclaimer, or warning notice included on or embedded in any part of the Software (including any screen displays, etc.), or (v) interfere with or disrupt the integrity of the Software or the data contained therein. If Customer becomes a direct competitor of VUEWORKS, Customer shall not access or use the Software, or monitor its availability, performance, or functionality.

b. *Export Controls*. VUEWORKS provides Software and uses software and technology that may be subject to U.S. export controls administered by the U.S. Department of Commerce, the U.S. Department of Treasury Office of Foreign Assets Control, and other U.S. agencies. Customer shall not access or use the Software or otherwise transfer or export or re-export to countries that the United States maintains an embargo (collectively, "Embargoed Countries"), or to or by a national or resident thereof, or any person or

entity on the U.S. Department of Treasury's List of Specially Designated Nationals or the U.S. Department of Commerce's Table of Denial Orders (collectively, "Designated Nationals"), each of which may change from time to time. By using the Software, Customer represents and warrants that Customer is not located in, under the control of, or a national or resident of, an Embargoed Country or Designated National. The Software may use encryption technology that is subject to licensing requirements under the U.S. Export Administration Regulations, 15 C.F.R. Parts 730-774.

1.4 Availability of Services.

a. *Uptime Commitment*. If Customer has selected the Hosted Software, VUEWORKS offers a performance commitment that the key features of the Hosted Software will be available for access and use by Customer at least 99% of the time per calendar quarter, excluding any period of Permitted Unavailability (the "**Uptime Commitment**"). Absent unusual circumstances, VUEWORKS shall schedule Planned Outages during non-peak hours. The Uptime Commitment are subject to the terms of this Section.

b. *Procedure*. When a period of unavailability is detected by Customer, Customer shall promptly contact VUEWORKS by email or phone and advise VUEWORKS' staff of the problem.

c. *Limitations*. VUEWORKS is not responsible for periods of unavailability resulting from failure by Customer to make or approve reasonable modifications to the Software or the Hosted Software recommended by VUEWORKS to prevent periods of unavailability. In addition, VUEWORKS will not be responsible for periods of unavailability resulting from any of the following: (i) Customer modifications to or uses of the Software or Hosted Software that are not authorized by VUEWORKS or permitted under this Agreement, (ii) Permitted Unavailability or (iii) Customer errors in integration.

d. *Monitoring*. VUEWORKS does not guarantee that remote monitoring will detect all problems or interruptions at the time they occur.

1.5 Ownership. The Software is licensed, not sold. Except for the limited license granted in Section 1.1 (Software License) to access and use the Software, VUEWORKS and its licensors reserve all right, title, and interest, express or implied, in and to the Services and systems, VUEWORKS' web apps, and the data and information VUEWORKS provides (collectively, the "**Retained Rights**"). If Customer makes improvements or other modifications to the Retained Rights when using the Software, Customer hereby grants to VUEWORKS a nonexclusive, royalty-free, fully paid-up, irrevocable, perpetual, worldwide license (with the right to assign and sublicense) to use, display, copy, distribute, modify, make derivative works of, sell, and import such modifications and improvements. Nothing in the preceding sentence is to be construed as granting VUEWORKS any rights to Customer's name, trade name, trade dress, logos, data and the like.

1.6 Customer Data; Indemnity. Customer grants VUEWORKS the right to use, display, copy, distribute, and make derivative works of Customer Data for purposes of enabling VUEWORKS to offer and perform its services to Customer and fulfill its obligations to Customer and for no other purpose. Customer represents and warrants that (a) it has obtained all rights, consents, and permissions necessary to input the Customer Data into the Software and to grant the foregoing rights to VUEWORKS, (b) Customer's use, copying, displaying, and distribution of the Customer Data complies with all federal, state, and/or local laws, rules, regulations and/or ordinances and the terms and policies (including terms of use and privacy and security policies) of all websites from which the Customer Data originated and all websites to which the Customer Data is copied, distributed, displayed, or published using the Software, and (c) the Customer Data shall not include any personally identifiable healthcare data or financial data of any individual and/or any other data violative of third party rights and/or any applicable law, and/or any data relating to any person under the age of thirteen (13) years. Customer shall indemnify, defend, and hold harmless VUEWORKS and its affiliates and subsidiaries and their respective officers, directors, employees, members, representatives, and agents from and against any and all claims, losses, liability, damages, costs, and expenses (including reasonable out-of-pocket expenses and attorneys' fees) arising out of or relating to Customer's breach of the foregoing representations and warranties. VUEWORKS may refuse to distribute or publish, and may remove, any Customer Data that VUEWORKS determines to be in violation of the foregoing representations and warranties. VUEWORKS may combine the Customer Data with other information it gathers, develops, or licenses from others in offering and performing its services and fulfilling its obligations, for purposes of improving the Software, and for purposes of establishing and/or developing customer usage benchmarks and studies. VUEWORKS may not use customer's name and/or logo in conjunction with the establishment or development of benchmarks and studies nor publish any of customer's data entered into the system without the express written permission of the Customer.

1.7 Suspension of Access to Hosted Software. VUEWORKS may suspend Customer's access to the Hosted Software (in whole or in part) for any of the following reasons: (a) to prevent damages to, or degradation of, the Hosted Software or VUEWORKS' systems; (b) to comply with any law, court order, or other governmental request; (c) to otherwise protect VUEWORKS from potential legal liability; (d) if Customer violates the terms of this Agreement and fails to remedy such breach within the time frame set forth herein. VUEWORKS shall provide Customer with notice before or if not possible beforehand promptly following any suspension of access to the Hosted Software. VUEWORKS shall restore access to the Hosted Software as soon as the event giving rise to suspension has been resolved in accordance to the Customer's obligations under law, court order or the terms of this Agreement. Sections 1.5 and 1.6 are not to be construed as imposing any obligation or duty on VUEWORKS to monitor Customer's use of the Hosted Software or the Customer Data or other content uploaded by Customer and/or its customers.

1.8 Intellectual Property Infringement Indemnification.

(a) Should the Software and/or any other VUEWORKS' software and/or service or use thereof become, or be likely to become in VUEWORKS' reasonable opinion, the subject of any claim that the same infringes, violates or constitutes a wrongful use of any intellectual property right, VUEWORKS may, at its option: (i) procure for Customer the right to continue using the potentially infringing materials; (ii) replace or modify the potentially infringing materials to make them non-infringing, but substantially functionally equivalent; or (iii) terminate this Agreement and refund to Customer a pro-rated portion of any fees paid hereunder.

(b) VUEWORKS will defend Customer against any third party claim(s) that the VUEWORKS Software infringes that third party's patent, copyright, or trademark, or misappropriates its trade secrets and will pay the amount of any resulting adverse final judgment (or settlement to which VUEWORKS' consents). Customer will notify VUEWORKS promptly in writing of the claim and give VUEWORKS sole control over its defense or settlement. Customer agrees to provide VUEWORKS with reasonable assistance, cooperation, and information in defending the claim at VUEWORKS expense.

(c) THE FOREGOING PROVISIONS OF THIS SECTION 1.8 STATE THE ENTIRE LIABILITY AND OBLIGATIONS OF VUEWORKS, AND THE EXCLUSIVE REMEDY OF CUSTOMER, WITH RESPECT TO ANY ACTUAL OR ALLEGED INFRINGEMENT OF ANY PATENT, COPYRIGHT, TRADE SECRET, TRADEMARK OR OTHER INTELLECTUAL PROPERTY RIGHT BY THE SOFTWARE, THE HOSTED SOFTWARE, AND/OR ANY OTHER VUEWORKS' SOFTWARE AND/OR SERVICE.

1.9 Technical Support; Maintenance. Provided Customer has made all required payments of undisputed invoices hereunder, VUEWORKS shall provide technical support for the Software in accordance with VUEWORKS' technical support policies ("**Technical Support**") included as Exhibit A (Maintenance and Technical Support Policy) to this Agreement. Provided Customer has purchased maintenance from VUEWORKS, in accordance with Exhibit B (Project Pricing), and Customer has paid all amounts due under such Order Form, VUEWORKS will perform maintenance with respect to the Software in accordance with VUEWORKS' maintenance policies ("**Maintenance**").

2. **Feedback**. Customer may provide suggestions, comments, or other feedback (collectively, "**Feedback**") to VUEWORKS with respect to its offerings and services, including the Software. Feedback is voluntary and VUEWORKS is not required to hold it in confidence. VUEWORKS may use Feedback for any purpose however, VUEWORKS may not use Customer's name or logo in any publication, marketing materials or for any other purpose other than performing the services pursuant to this Agreement without express written permission of Customer. Customer hereby grants VUEWORKS an irrevocable, non-exclusive, perpetual, fully-paid up, royalty-free license to use, display, copy, distribute, modify, make derivative works of, sell, and import the Feedback in connection with VUEWORKS' business, including enhancement of the Software.

3. **Customer Data Maintenance.** To the extent that Customer selects the Hosted Software, Customer shall deliver to VUEWORKS Customer Data, including GIS Data, in a format specified by VUEWORKS. VUEWORKS shall present the GIS Data using symbols and line types determined by VUEWORKS. The maximum number of GIS Data Layers are set forth in each applicable Order Form. The total amount of Customer Data is limited to the Customer Data Amount set forth in each applicable Order Form. Customer may request that VUEWORKS provide services to update Customer Data including GIS Data so long as VUEWORKS continues to provide the Hosted

Software. VUEWORKS shall invoice Customer for such requested services at its then current data maintenance rates (the "**Data Maintenance**").

4. **Term and Renewal**. The initial term of this Agreement commences on the Effective Date and shall continue for five (5) years from the first day of the month from the Effective Date unless terminated earlier in accordance with the terms of this Agreement, with one (1) three (3) year renewal period available at the end of the initial five (5) year term. VUEWORKS will not increase the annual fee applicable during the initial five (5) year term or the subsequent optional three (3) year renewal. In the event the Customer chooses to renew for one (1) year, the new annual fee shall not exceed more than a 3% increase from the prior in-force term. Subsequent renewals shall follow the same renewal conditions. The license term ("**License Term**") with respect to use of the Software is perpetual but VUEWORKS shall have no obligation to provide the Hosted Software beyond the term of this Agreement and any renewal.

5. **Termination; Effect**. VUEWORKS may terminate this Agreement if the Customer breaches any material provision of this Agreement, and fails to cure such breach within forty-five (45) days after receipt of notice from VUEWORKS describing the breach with specificity. If VUEWORKS terminates the Agreement prior to the completion of the Term, through no fault of the Customer, VUEWORKS shall reimburse the Customer for all fees paid. The Customer may terminate this Agreement if VUEWORKS breaches any material provision of this Agreement, and fails to cure such breach within seven (7) days after receipt of notice from the Customer describing the breach with specificity. The Customer may terminate this Agreement upon thirty (30) days written notice for any reason. If funds for the continued fulfillment of this Agreement by the Customer are at any time not forthcoming, or are insufficient, through the failure of any entity – including the Customer itself – to appropriate funds or otherwise, then the Customer shall have the right to terminate this Agreement without penalty. In the event of termination by the Customer, VUEWORKS shall be paid for all services rendered, provided VUEWORKS has delivered the services to the Customer up to and including the date of termination. The parties' rights and obligations, which by their nature would continue beyond the expiration or termination of this Agreement shall survive any termination or expiration of this Agreement, including, but not limited to, the following Sections: 1.5 (Ownership), 1.6 (Customer Data; Indemnity), 2 (Feedback), 5 (Termination; Effect), 6 (Fees and Payment), 7 (Confidentiality), 9 (Disclaimer of Warranties), 10 (Limitation of Liability and Damages), 11 (Certain Definitions), and 12 (General Provisions).

Upon any termination or expiration of this Agreement: (i) VUEWORKS shall cease providing access to the Hosted Software; (ii) VUEWORKS will cease performing all services being provided under this Agreement; (iii) promptly following the written request of the other party, each party will promptly return to the other party or destroy (in accordance with the other party's request) all property and equipment of the other party in its possession or control, including all copies thereof, and will certify in writing that it has complied with such request, (iv) VUEWORKS will deliver to Customer an object code version of the Software for installation by the Customer on the Customer's servers; and (v) within forty-five (45) days of the date of termination or expiration of this Agreement, as the case may be VUEWORKS shall provide Customer with a download of the Customer Data. After such 45-day period, VUEWORKS shall have no obligation to maintain or provide any Customer Data and may thereafter, unless legally prohibited, delete all Customer Data provided that VUEWORKS provided written notice of the intent to delete Customer Data.

6. **Fees and Payment**. Customer shall pay VUEWORKS the fees for the Software and Hosted Software along with the fees for Technical Support, Maintenance and, if applicable, Data Maintenance as outlined in the Project Pricing (Exhibit B). Payment by the City of undisputed invoices shall be due within sixty (60) days of presentation of DTS's invoice. If Customer believes that an invoice is incorrect or otherwise disputes the invoice and Customer desires to obtain an adjustment of such invoice, Customer must provide VUEWORKS notice thereof including relevant details within thirty (30) days of the invoice date. Customer is responsible for sales, use, and similar taxes associated with its receipt and use of Software, including the Hosted Software, Technical Support, Maintenance and Data Maintenance.

7. **Confidentiality**. As used herein, "Disclosing Party" and "Recipient" refer respectively to the party which discloses information and the party to which information is disclosed in a given exchange. Either VUEWORKS or Customer may be deemed Disclosing Party or Recipient depending on the circumstances of a particular communication or transfer of information. Recipient will hold the Confidential Information of the Disclosing Party in confidence, using the same degree of care that it uses to protect its own information of similar importance, but will in any case use no less than a reasonable degree of care to protect Confidential Information. Recipient will not directly or indirectly disclose Confidential Information or any part thereof to any third party (who is not an authorized

employee or agent of the receiving party) without Disclosing Party's advance express written authorization to do so. Recipient may disclose Confidential Information only to its employees or agents in the normal course of its business and only on a need-to-know basis. Additionally, a party will not be prohibited from disclosing the Confidential Information to the extent required by applicable law, statute, rule, regulation, or regulatory or administrative body. In the event Customer receives a public records request or similar request – such as a subpoena – for confidential information, Customer shall promptly notify VUEWORKS at support@vueworks.com. VUEWORKS may provide guidance to Customer as to whether, in its opinion, the requested information is a trade secret or otherwise protected from disclosure under Wisconsin law. Any such guidance shall be provided within three (3) business days of receipt of Customer's notice, time being of the essence. Customer agrees to consider any guidance provided by VUEWORKS in making its decision how to proceed under the Wisconsin Public Records Law or similar law. If Customer agrees to follow the guidance provided by VUEWORKS, VUEWORKS agrees to indemnify, defend, and hold the Customer harmless from liability of any kind whatsoever that may result from the Customer following the guidance from VUEWORKS, in which case no Limitation of Liability language in this Agreement shall apply. If the City receives a subpoena or similar request for confidential information, nothing in this section prevents VUEWORKS from seeking a restraining order or other appropriate relief. In the event VUEWORKS receives a subpoena or similar request for confidential information, VUEWORKS shall promptly notify Customer at david.biebel@sheboyganwi.gov and shall, to the extent permissible by law, allow the Customer to provide guidance as to whether the information is protected from disclosure under Wisconsin law and allow the Customer to seek a restraining order or other appropriate relief. Each party acknowledges that the other party will suffer irreparable injury as a result of any misuse, disclosure or duplication of its Confidential Information by the other party in violation of this clause. Accordingly, the injured party shall be entitled in such event to seek injunctive relief, without proving actual damage or posting a bond or other security, in addition to any other applicable remedies, including the recovery of damages. Such party shall be entitled to recover its costs and fees, including reasonable attorneys' fees, incurred in obtaining such relief. The non-breaching party may immediately terminate this Agreement upon notice to the other party for any breach of that party's obligation set forth in this Section. **Software Warranty**. VUEWORKS warrants that the software will perform without defects during the term of this Agreement. If the Software does not perform as warranted, VUEWORKS will use all reasonable efforts consistent with industry standards, to cure the Defect in accordance with the maintenance and support processes set forth in Exhibit C (Software Support and Maintenance Provisions).

8. **Hosting Warranty**. VUEWORKS warrants that it will host Customer on a database which is inaccessible to other customers of the Cloud Hosting service, that it tests its disaster recovery plan on an annual basis, and that it will provide secure data transmission paths from each of Customer's work stations to VUEWORK's services.

9. **Disclaimer of Warranties**. The Software (including the Hosted Software) may include gateways, links, or other functionality that allows Customer to access third party services ("**Third Party Services**") and third party content and materials ("**Third Party Materials**"). VUEWORKS does not supply and is not responsible for any Third Party Services or Third Party Materials, which may be subject to their own licenses, end-user agreements, privacy and security policies, and terms of use. ALL THIRD PARTY MATERIALS ARE PROVIDED AS-IS, WITHOUT WARRANTIES OF ANY KIND. VUEWORKS MAKES NO WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, RELATING TO ANY PRESENT OR FUTURE METHODOLOGY EMPLOYED IN ITS GATHERING OR REPRODUCING OF ANY THIRD PARTY MATERIAL, OR AS TO THE ACCURACY, CURRENCY, OR COMPREHENSIVENESS OF THE SAME. ALL OF THE FOREGOING EXCLUSIONS AND DISCLAIMERS IN THIS SECTION ARE AN ESSENTIAL PART OF THIS AGREEMENT AND FORMED THE BASIS FOR DETERMINING THE PRICES CHARGED FOR THE SOFTWARE, HOSTED SOFTWARE, TECHNICAL SUPPORT, MAINTENANCE, DATA MAINTENANCE AND ANY OTHER SERVICE PROVIDED IN CONNECTION WITH THIS AGREEMENT.

10. **Limitation of Liability and Damages**. EXCEPT IN THE CASE OF LIABILITY ARISING OUT OF A PARTY'S BREACH OF ITS CONFIDENTIALITY OBLIGATIONS OR PURSUANT TO A PARTY'S INDEMNITY OBLIGATIONS, NEITHER PARTY WILL HAVE ANY LIABILITY TO THE OTHER FOR ANY LOSS OF PROFITS, SALES, BUSINESS, DATA, OR OTHER INCIDENTAL, CONSEQUENTIAL, OR SPECIAL LOSS OR DAMAGE, INCLUDING EXEMPLARY AND PUNITIVE DAMAGES, OF ANY KIND OR NATURE RESULTING FROM OR ARISING OUT OF THIS AGREEMENT, THE SOFTWARE,

HOSTED SOFTWARE, TECHNICAL SUPPORT, MAINTENANCE, DATA MAINTENANCE, OR ANY SERVICES RENDERED UNDER THIS AGREEMENT. THE TOTAL LIABILITY OF A PARTY TO THE OTHER PARTY ARISING OUT OF THIS AGREEMENT, THE SOFTWARE, HOSTED SOFTWARE, TECHNICAL SUPPORT, MAINTENANCE, DATA MAINTENANCE, AND ANY SERVICES RENDERED UNDER THIS AGREEMENT FOR ANY AND ALL CLAIMS OR TYPES OF DAMAGES WILL NOT EXCEED THE TOTAL FEES PAID HEREUNDER BY CUSTOMER DURING THE 12 MONTHS IMMEDIATELY PRECEDING THE FIRST EVENT GIVING RISE TO LIABILITY.

11. **Certain Definitions.** As used in this Agreement, the terms below when capitalized have the following meanings:

"**Confidential Information**" means nonpublic information that a reasonable person would believe to be confidential and includes, without limitation, personal identifying information and trade secrets, each as defined by applicable state law. For the avoidance of doubt, this Agreement and its attachments (including the pricing information) is not Confidential Information. "Confidential Information" does not include information that (a) is or becomes generally known to the public or made available on the Internet at any time by any means other than a breach of the obligations under this Agreement of a receiving party; (b) was received by the receiving party from a third party who had a lawful right without restriction to disclose such information; (c) is independently developed by the receiving party without any use of or reliance on any Confidential Information; or (d) the receiving party lawfully had knowledge of, or access to, prior to the time of disclosure by the disclosing party.

"Customer Data" means GIS Data, VUEWORKS' database files, Customer's data base files, and all other electronic content and data stored on VUEWORKS' computers for use by Customer with the Hosted Software. Amount of Customer Data to be stored shall be measured in bytes and be limited to the amount of disk space provided in each the applicable Order Form. Procedures by which Customer may store and access Customer Data via VUEWORKS' servers shall be limited to the use of the Hosted Software. Customer acknowledges that VUEWORKS shall have no obligation to return to Customer any Customer Data if Customer has not paid all amounts due hereunder or does not comply with the notice procedure with respect to the return of Customer Data set forth in Section 5.

"GIS Data" means spatial data as part of a geographic information system data.

"**Order Form**" means the order form set forth as the cover page to this Agreement or any other order form executed by the parties.

"**Permitted Unavailability**" means unavailability of the Hosted Software due to Planned Outages, a force majeure event (as provided in Section 11.8), any software, hardware, or telecommunication or digital transmission failures or interruptions, Internet slow-downs or failures, third party software, hardware, or service failures, or any actions or inactions of Customer or Customer's vendors or service providers, that prevents, limits, or degrades the availability or use of some or all of the Hosted Software.

"**Planned Outages**" means the period of time during which VUEWORKS conducts standard systems maintenance.

"**Software**" means the VUEWORKS' software listed on each applicable Order Form, which software may be Hosted Software. VUEWORKS may in its sole discretion update or make changes to the functionality of the Software from time to time.

12. **General Provisions.**

12.1 Notices. Except as expressly provided by this Agreement, any notice, request, instruction, or other communication required or permitted to be given under this Agreement shall be in writing (collectively, "Notices"), delivered to the addresses first set forth above, to the attention of Chief Operating Officer, with respect to VUEWORKS, and to the attention of the City Clerk, with respect to Customer. Copies of all Notices to VUEWORKS shall also be delivered to Atkins North America, Inc. 2001 NW 107 Avenue, Miami, FL 33172 Attention: Rene de los Rios. All such Notices shall be effectively given: (i) upon personal delivery to the party to be notified; or (ii) upon receipt when delivered by a nationally recognized overnight courier, with written verification of receipt; or (iii) upon receipt as indicated by the date on the signed receipt when delivered by registered or certified mail, return receipt requested and postage prepaid; or (iv) if the party to which it is addressed rejects or otherwise refuses to accept it, or if it cannot be delivered because of a change in address for which no notice was given, then upon that

rejection, refusal, or inability to deliver. The parties may change their respective addresses for which Notices shall be received upon compliance with the terms of this Section.

12.2 Amendment; Waivers; Interpretations. No amendment, rescission, or termination of this Agreement or any of its terms is effective unless it is in writing and signed by the party against whom enforcement is sought. A party does not waive any right under this Agreement by failing to insist on compliance with any term of this Agreement or by failing to exercise any right hereunder. Any waiver granted hereunder is effective only if it is written and signed by the party granting such waiver. A waiver of any provision of this Agreement shall not imply a subsequent waiver of that or any other provision of this Agreement. The parties agree that the terms and conditions of this Agreement are a result of mutual negotiations. Therefore, the rule of construction that any ambiguity shall apply against the drafter is not applicable and will not apply to this Agreement. Any ambiguities shall be reasonably construed as to its fair meaning and not strictly for or against one party regardless of who authored the ambiguous language.

12.3 Assignment. Neither party may assign this Agreement, in whole, or in part, without the express prior written consent of the other. Any attempt to assign this Agreement in violation of this Section 12.3 shall be void. Subject to the foregoing, all terms and conditions of this Agreement shall be binding upon and shall inure to the benefit of the parties to this Agreement and their respective successors and permitted assigns.

12.4 Governing Law. The laws of the State of Wisconsin govern all matters arising out of or relating to this Agreement, including, without limitation, its interpretation, construction, performance, and enforcement, without giving effect to such state's conflicts of law principles. The parties hereby irrevocably and unconditionally submit to the jurisdiction of the state courts located in Sheboygan County, Wisconsin for the purpose of any suit, action, or other proceeding arising out of or based upon this Agreement, which courts are the exclusive forum for any such suit, action, or other proceeding.

12.5 Severability. If any term or provision of this Agreement is held invalid or unenforceable, then that provision is to be construed by modifying it to the minimum extent necessary to make it enforceable, unless such modification is not permitted by law, in which case that provision is to be disregarded. If an unenforceable provision is modified or disregarded in accordance with this Section, the rest of this Agreement is to remain in effect as written, and the unenforceable provision is to remain as written in any circumstances other than those in which the provision is held to be unenforceable.

12.6 Entire Agreement. This Agreement, together with the exhibits and attachments hereto and thereto, constitutes the entire and final agreement between the parties. It is the complete and exclusive expression of the parties' agreement on the matters contained in this Agreement. All prior and contemporaneous negotiations, term sheets, letters, memoranda, and other discussions and agreements, either oral or in writing, between the parties on the matters contained in this Agreement are expressly merged into and superseded by this Agreement. No provision of this Agreement may be explained, supplemented, or qualified through evidence of trade usage or a prior course of dealings. This Agreement shall prevail over any terms and conditions appearing on either Party's purchase orders or other ordering documents.

12.7 Relationship of Parties. The parties to this Agreement are independent contractors; there is no relationship of agency, partnership, joint venture, employment, or franchise between the parties. Neither party has the authority to bind the other or to incur any obligation on its behalf.

12.8 Force Majeure. Neither party shall be liable for delays in performing its obligations under this Agreement to the extent the delay is caused by Force Majeure; provided, however, that within ten (10) business days of the Force Majeure event, the party whose performance is delayed provides the other party with written notice explaining the cause and extent thereof, as well as request a reasonable time extension equal to the estimated duration of the Force Majeure Event.

12.9 No Third Party Beneficiaries. Nothing contained in this Agreement shall create a contractual relationship with, or a cause of action in favor of, any third party. It is expressly understood and agreed that the enforcement of these items and conditions shall be reserved to the Customer and VUEWORKS. Nothing contained in this Agreement shall give or allow any claim or right of action whatsoever by any third person. It is the express intent of the Customer and VUEWORKS that any such person or entity, other than the Customer and VUEWORKS, receiving services or benefits under this Agreement shall be deemed an incidental beneficiary.

12.10 Headings. The descriptive headings of the sections and subsections of this Agreement are for convenience of

reference only. They do not constitute a part of this Agreement and do not affect this Agreement's construction or interpretation.

12.11 Publicity. Neither party shall use the other party's name or logo, or refer to the other party directly or indirectly in any media release, public announcement, or public disclosure relating to this Agreement or its subject matter, including any promotional or marketing materials, lists, referral lists, or business presentations, without written consent from the other party for each such use or release. VUEWORKS expressly consents to Customer taking the steps necessary to obtain approval of this Agreement from Customer's Common Council, including, to the extent Customer deems necessary, referring to VUEWORKS and the contents of this Agreement. Such approval will not be unreasonably withheld.

12.12 Counterparts. If the parties sign this Agreement in counterparts, each counterpart constitutes an original, and all counterparts, collectively, constitute only one agreement. The signatures of all the parties need not appear on the same counterpart, and delivery of a signed counterpart signature page by fax or other electronic transmission is as effective as signing and delivering an original.

12.13 Indemnification. VUEWORKS shall indemnify and hold the Customer harmless from liability, loss or damage the Customer may suffer as a result of, costs or judgments against it to the extent caused by VUEWORKS' negligence, intentional or willful misconduct or violation of law, in the performance of this Agreement.

IN WITNESS WHEREOF, the parties hereto, by their duly authorized representatives, have signed this Agreement as of the Effective Date.

DATA TRANSFER SOLUTIONS, LLC

By: 

Name: Donna Huey
Title: President

City of Sheboygan, WI

By: _____

Name:
Title:

vueworks

Exhibit A - MAINTENANCE & TECHNICAL SUPPORT POLICY

1. VUEWorks technical support is available from 8:00am to 6:00pm, Eastern Time, on all weekdays other than Federal holidays. VUEWorks' support includes answering questions from Customer over the telephone or e-mail, and the commercially reasonable effort to have the VUEWorks Software functioning properly in accordance with the documented product features and specifications.
2. VUEWorks Support must be initiated either through calling the support line (800) 252-2402 x2 or Support Email: support@vueworks.com. VUEWorks recommends the use of email as it serves as a written record of the event.
3. Customer shall designate one individual to serve as the primary support contact for requests. Additionally, customer may designate as many as two (2) more secondary individuals who may contact VUEWorks directly for support issues. Other arrangements will be addressed on a case by case basis and must be agreed to in writing by Customer and VUEWorks.
4. The initial contact, whether invoked by email or telephone for a particular issue, defines the beginning of a support incident.
5. In cases where a VUEWorks staff member is unable to answer the phone, or when the Customer uses email for a support request, Customer will include in the message their name, their organization, a thorough description of the steps that preceded the problem, and a call back number. Screen shots and complete descriptions of the problem, activities leading to the problem and any related detail are most helpful. VUEWorks may not be able to respond if this information is not provided.
6. Common incidents include operational questions, improvement suggestions, problems related to changes in the customers' GIS environment, problems related to changes in the customers' VUEWorks implementation, and problems related to defects in the software.
    a. If the incident involves a defect in the VUEWorks software, VUEWorks will provide the commercially reasonable effort to fix the defect(s) at no charge.
        i. A defect is defined as an issue with the software during the normal course of operation where the software does not function as documented due to an error in the software code.
        ii. A defect is often, but not always, accompanied by an error message.
        iii. VUEWorks software has many dependencies that could generate error messages that are delivered through VUEWorks but are

not VUEWorks software defects. These include but are not limited to:

1. Esri GIS Software (ArcGIS Server or ArcIMS)
2. MS SQL Server
3. Server operating system
4. Permissions
5. Hardware
6. Network connectivity
7. Individual client computer issues
    a. Individual Client computer issues are identified when the issue occurs on a limited number of computers but not on all computers using the same VUEWorks user login.

b. VUEWorks reserves the right to determine if an issue is caused by a VUEWorks software defect or not.

7. If the issue is determined to be anything other than a defect in the VUEWorks software code then VUEWorks will provide up to 30 minutes of technical support at no charge, followed by a charge of two hundred dollars ($200) per hour per incident.
8. VUEWorks technical services do not include support for Esri Software. While VUEWorks staff may attempt, at its sole discretion, to resolve issues stemming from Esri Software, the Customer recognizes that these types of issues are best supported through Esri's many support channels.
9. VUEWorks handles incident reports in the following manner
Each incident logged will be given a priority of 0 to 4 as determined by VUEWorks technical support staff. VUEWorks will first attempt to resolve the issue with the Customer upon initial response. If the issue cannot be resolved during initial response then VUEWorks will respond to the request depending on the priority of the issue as defined in the following sections:
    a. Priority 0. Critical Issue. VUEWorks will start working on the issue within 4 business hours of initial response and continue to work on the issue during normal business hours until the issue is resolved. Examples of Critical Issues:
        i. No user at the Customer site can log on to VUEWorks
        ii. The map does not display on any user computer at the Customer's site.
        iii. No user at the Customer's site can create a Service Call or Work Order
    b. Priority 1. Severe Issue. VUEWorks will start working on the issue within one business day of initial response and continue to work on the issue during normal business hours until the issue is resolved if any of the following occurs:
        i. VUEWorks generates information that is obviously and substantially incorrect

ii. A feature produces error messages that causes an application feature to stop functioning or not produce results

c. Priority 2. Important Issue. If the issue cannot be resolved through the initial response process then VUEWorks will start working on the issue within 5 business days and resolve the issue within 30 days thereafter if any of the following occurs:
   i. An issue reported by Customer that can be resolved by providing help on using a specific feature
   ii. Issues that cause an error message but do not cause the application to stop functioning or create results that are substantially incorrect
   iii. Issues acknowledged by VUEWorks as a defect that can be avoided without loss of functionality through a work around process

d. Priority 3. Low priority issues. If the issue cannot be resolved through the initial response process then VUEWorks will document the issue but not be obligated to respond within any specific time frame for the following types of issues:
   i. Issues or questions that are not directly related to the functionality of the product
   ii. Non-contractual application enhancement request (the "Wishlist"). A non-contractual request to provide features in VUEWorks that are not in the current product.

e. Priority 4. Issue is not directly related to VUEWorks software. If an issue is determined to be related to hardware, browser, or operating system malfunction VUEWorks will notify Customer that the issue must be resolved by the Customer. These cases are usually substantiated if the issue occurs on only one user computer and cannot be replicated on another user computer or at VUEWorks' test environment

VUEWorks will provide commercially reasonable effort based on the above guidelines. If it is determined that the effort required to resolve the issue is not included in this Annual Maintenance and Support policy, work will stop and the Customer will be advised that the work is not covered. At VUEWorks' discretion, the customer may be provided an option for VUEWorks to continue the work at an agreed to cost and scope.

10. *Direct Server Access*: In order for VUEWorks to provide adequate support, the Customer agrees to provide VUEWorks the means to remotely control and transfer files with the Customer's VUEWorks server, the GIS server and the SQL server through the Internet.
    a. VUEWorks recommends LogMeIn software for remote access but will work with any commercially acceptable system that provides remote control and file transfer capabilities as preferred by the Customer
    b. This requirement allows VUEWorks support staff to:
       i. Offer the Customer software update services to install patches, updates, and upgrades that would otherwise require Customer resources

ii. Ability for VUEWorks staff to directly operate VUEWorks at the Customer site for the purpose of investigating issues reported by the Customer
iii. Attempt to resolve issues remotely that would otherwise require an On-Site visit

c. Customers understands and agrees that if remote access to Customers servers is not provided then the all response times documented in item 10 above will not apply.
   i. VUEWorks agrees to not access any other data or applications other than required for VUEWorks support purposes.

Exhibit B - Project Pricing

VUEWorks ELA Software Licensing (50 concurrent users) (Software to be hosted by Ruekert-Mielke on behalf of the City of Sheboygan, IL.)	**$85,000.00**
VUEWorks Maintenance & Support (Invoiced annually by Ruekert-Mielke)*	**$17,000.00**
Year One Project Total (Invoiced by DTS)	**$85,000.00**

*Per Paragraph 4 of the **Software License Agreement** (Exhibit A), Annual Support and Maintenance costs for Years 6 – 8 will be $17,000.

CITY OF SHEBOYGAN

REQUEST FOR PUBLIC WORKS COMMITTEE CONSIDERATION

ITEM DESCRIPTION: A resolution authorizing the appropriate City officials to execute agreements with Ruekert & Mielke Inc. and Data Transfer Solutions, LLC regarding the purchase and implementation of the VUEWorks Enterprise Asset Management System, and authorizing the appropriate City officials to make the necessary budget adjustments and appropriations to provide funding for these agreements.

REPORT PREPARED BY: David H. Biebel, Director of Public Works

REPORT DATE: December 9, 2021 **MEETING DATE:** December 14, 2021

FISCAL SUMMARY:

Budget Line Item:	Various – See Resolution
Budget Summary:	Various – See Resolution
Budget Expenditure:	$363,900.00
Budgeted Revenue:	N/A

STATUTORY REFERENCE:

Wisconsin Statues:	N/A
Municipal Code:	N/A

BACKGROUND / ANALYSIS: This IFC provides the City of Sheboygan Department of Public Works recommendation of the vendor to provide a software-based Enterprise Asset Management system linked with the department's Geographical Information System. The department reviewed two proposals, VUEWorks and Cityworks, after demonstrations and interviews the VUEWorks proposal is approximately $100,000 less than the Cityworks proposal and less expensive over the next five-years when including annual licensing and support. Overall, the staff felt that both vendors and systems provide similar capabilities and met the criteria. Some of the staff had prior knowledge of Cityworks and were aware of other municipalities that use Cityworks currently. Nevertheless, VUEWorks demonstrated their competence and abilities during the demonstration that staff felt comfortable and confident that VUEWorks would perform and meet the department's expectations. Furthermore, Cityworks cost did not provide additional value or features that would justify the additional expense.

The department talked with the City of Waukesha that has been using VUEWorks since 2010. In talking with Waukesha's GIS Coordinator, he had both experience with Cityworks, at his previous employer, and now VUEWorks in his current position with the City of Waukesha and commented: *"Overall we've been happy with VUEWorks. My previous experience had been with Cityworks, which I found to perhaps be more intuitive right out of the box. But my experience with VUEWorks has shown it to perhaps*

be more customizable and powerful (to the point where I don't have enough time to actually set up all the possible uses of it!). Integration with ESRI map services works well, and their mobile applications are decent and improving."

He further provided a web-conference showing live screen views of the City of Waukesha's VUEWorks and its GIS application. This was reassuring with respect to an actual municipality using the software and demonstrating its ability. The customer request screen linked to the City's website was a great feature as well as tracking customer requests. In addition, according to Waukesha's GIS Coordinator, VUEWorks customer service and support is excellent.

He did say however, Cityworks is excellent as well and would also be a great system to consider; however, neither one is significantly better than the other. He felt Cityworks was easier "initially out-of-the-box but VUEWorks has more customization and features without the need to purchase other modules."

Based upon this review the DPW is recommending to enter into agreement with VUEWorks to provide a software-based Enterprise Asset Management system linked with the department's Geographical Information System. Ruekert & Mielke, Inc. has been selected to assist with the implementation of the EAM. Ruekert & Mielke implementation project team will coordinate with City staff to keep the project moving forward on schedule. They will conduct workshops with each division to determine how staff works today and provide input and information that will be used to configure the VUEWorks software. Ruekert & Mielke will manage the implementation from start to finish 24-month implementation. Lastly, Ruekert & Mielke is a civil engineering consulting firm located in Wisconsin and has provided consulting services to the department in the past.

STAFF COMMENTS: The main objective of Public Works is to preserve and extend the life of existing infrastructure. Currently, infrastructure management is reactive versus proactive. Proactive infrastructure management requires comprehensive data modeling and information systems to prioritize maintenance projects to maximize investment returns. The Public Works management team determined an enterprise management system would be a viable solution.

This technology would provide several benefits:

- Asset and Inventory Management which includes fleet, equipment and all city owned infrastructure.
- Technology will serve as mechanism for changing many "legacy" operations which include transferring data off the AS400 which is planned to be retired.
- Electronic Workorder System which will allow for prioritization of maintenance and increase efficiencies.
- Increase operational efficiencies by providing reporting methods for annual reporting.
- Change and improved decision making for capital improvements and budgeting.

- Mobile device capacity for city employees which will minimize downtime.

ACTION REQUESTED: Motion to recommend the Common Council adopt Res. No. 112-21-22 authorizing the appropriate City officials to execute agreements with Ruekert & Mielke Inc. and Data Transfer Solutions, LLC regarding the purchase and implementation of the VUEWorks Enterprise Asset Management System, and authorizing the appropriate City officials to make the necessary budget adjustments and appropriations to provide funding for these agreements.

ATTACHMENTS:

I. Res. No. 112-21-22
II. Ruekert & Mielke, Inc. Agreement

CITY OF SHEBOYGAN

REQUEST FOR PUBLIC WORKS COMMITTEE CONSIDERATION

ITEM DESCRIPTION: R.O. No. 106-21-22, submitting a communication from Dr. Toby Watson requesting permission to place four donated pianos with winter covers on city right-of-way at various locations in the downtown and riverfront to continue to foster Sheboygan's placemaking strategy to activate city streets.

REPORT PREPARED BY: Chad Pelishek, Director of Planning and Development

REPORT DATE: November 16, 2021 **MEETING DATE:** December 14, 2021

FISCAL SUMMARY:

Budget Line Item:	
Budget Summary:	N/A
Budgeted Expenditure:	N/A
Budgeted Revenue:	N/A

STATUTORY REFERENCE:

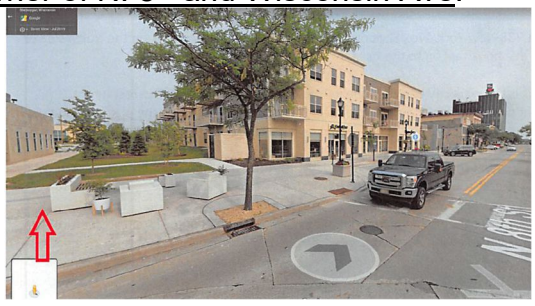
Wisconsin Statutes:	N/A
Municipal Code:	N/A

BACKGROUND / ANALYSIS: Dr. Toby Watson has contacted City Development staff about his interest in placing pianos along the street to bring music to the streets. The pianos would be provided free of charge and would include winter covers so they could stay on the street year-round. They would have screw eye hooks and chains to be attached to permanent structures to make sure they are not removed. Six locations around the city have been identified:

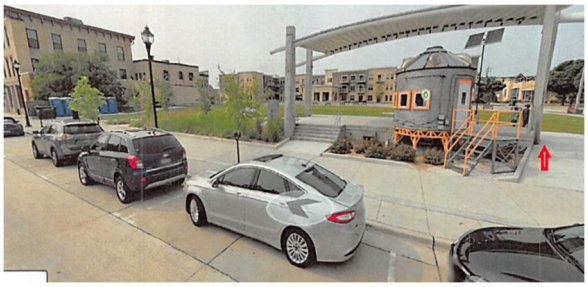
Fountain Park Monument



Corner of N. 8th and Wisconsin Ave.



City Green stage



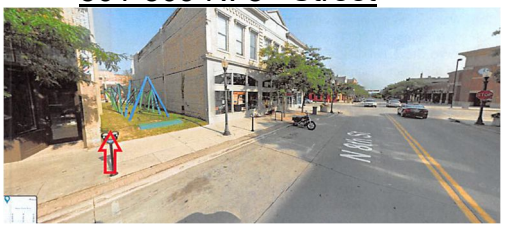
434 South Pier Drive



900 Broughton Drive



501-509 N. 8th Street



Mr. Watson would schedule tuning of the pianos in spring of each year. The only thing the City would need do is install and remove the winter covers. Public Works staff or Parking Utility staff could handle this a part of their cleanup of the downtown/riverfront.

STAFF COMMENTS: Picture below shows the four pianos currently being painted. City Development staff support this project as another means of activating our streets.



ACTION REQUESTED: Motion to hold.

ATTACHMENTS:

I. R.O. No. 160-21-22

II

Other Matters

7.1

R. O. No. 106 - 21 - 22. By DIRECTOR OF PLANNING AND DEVELOPMENT.
November 15, 2021

Submitting a communication from Dr. Toby Watson requesting permission to place four donated pianos with winter covers on city right-of-way at various locations in the downtown and riverfront to continue to foster Sheboygan's placemaking strategy to activate city streets.

The Department of Public Works and the Public Works committee shall identify the preferred locations of the pianos. The locations proposed include:

- Fountain Park Monument
- Corner of N. 8th Street and Wisconsin Avenue
- City Green stage
- 434 South Pier Drive (public walkway)
- 900 Broughton Drive (public shelter by memorial)
- 501-509 N. 8th Street

Dr. Watson would hire a piano tuner yearly to tune the pianos in the spring. City staff would be responsible for putting on and taking off the winter covers.

DIRECTOR OF PLANNING AND DEVELOPMENT

PW

Pelishek, Chad

From: Toby Watson <tobytylerwatson@gmail.com>
Sent: Sunday, November 7, 2021 10:10 PM
To: Sokolowski, Steve; Pelishek, Chad; Toby Watson
Subject: Music in the streets- Piano Donation

Good day Chad and Steve,

Here are the four locations that might work for the painted pianos (see attached photos corresponding to the narrative below).

I have a group of volunteers meeting next week to finish the weather tight preparation work and the painting of the pianos. I will then donate the pianos to the City, the Kohler Arts Center, the Children's Museum or another non profit, along with the Winter covers. I can place them in the desired locations and have them secured in those locations with a stainless steel eye hook and cable to the back of the piano. With the Winter covers there would be no need to move the pianos once in place. I envision the City of Sheboygan groundskeeping removing the covers in Spring and reapplying them in Fall. I will coordinate a piano tuner to tune them each Spring.

Here are a few ideas for locations, with corresponding photos attached:

1) Fountain Park monument (1013 N. 8th St., Sheboygan). The piano would face the sidewalk, and there will be 2 eye hooks to the rear of the piano, so they can be cable secured to the iron fence. Otherwise, it could be secured to the brick planter wall with a tapcon eye hook.

2) The corner of N. 8th Street and Wisconsin Ave. (800 N. 8th St., Sheboygan)

, where there is a concrete seating area. The piano would back up to the back side of the bench, and again, could be fastened to the concrete with a simple eye hook tapcon. Each piano will have these eye hooks and a stainless steel cable and keylock (given to the city).

3) Alternatively, it could be placed at 738 New York Ave., Sheboygan. This is the sound stage park on the North side of the street. It could be secured by an eye hook tapcon to the base of the east side of the stage area.

4) 434 S. Pier Drive, Sheboygan. This is the walkway between the ice cream store and Lino's Italian restaurant. Placement would be up against a light pole, and again, a single stainless steel cable could secure the piano around the base of the pole.

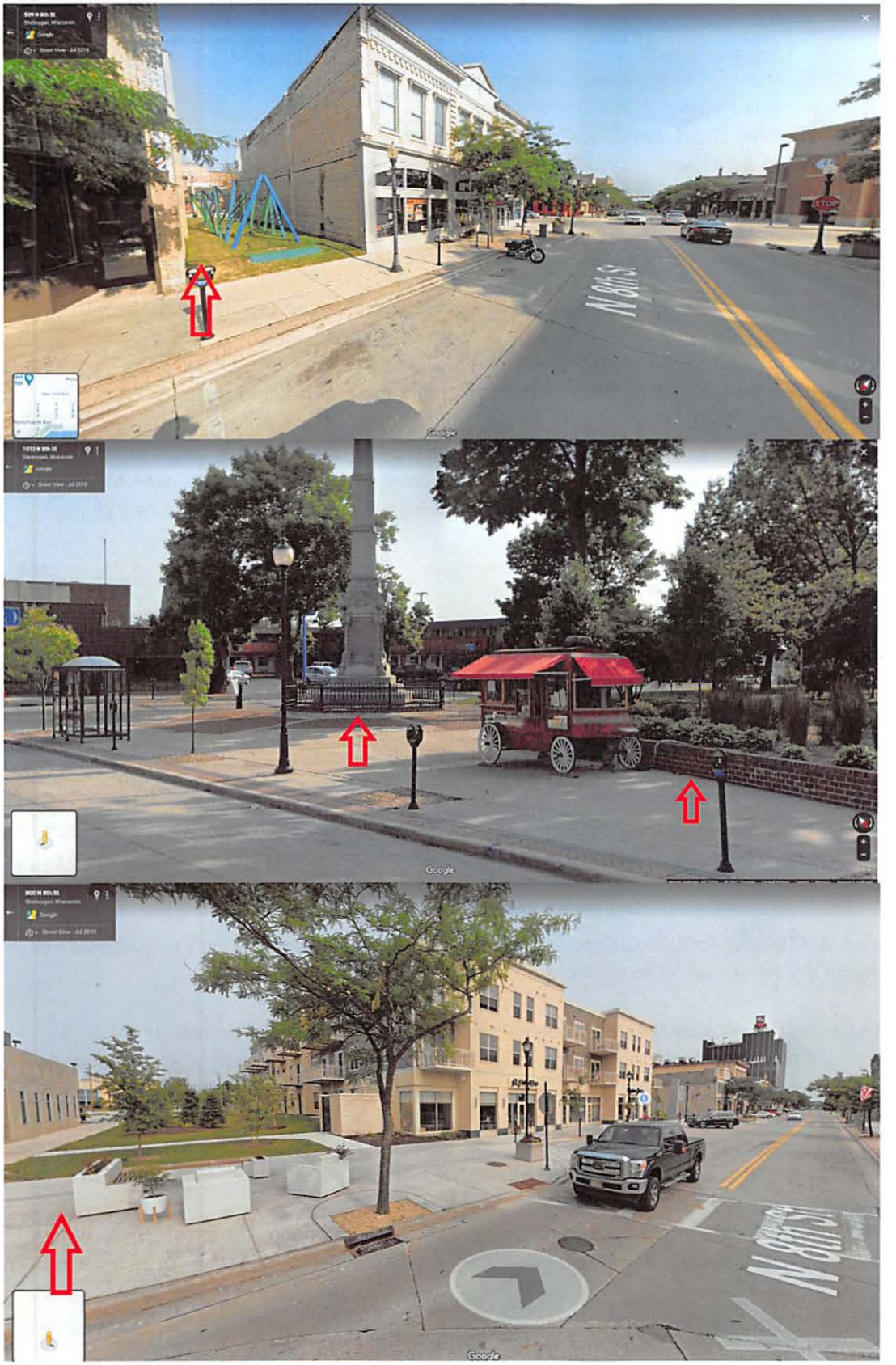
5. 900 Broughton Drive, Sheboygan. This just south of the beach, and just north of the Hmong and Lao memorial. The piano would be secured by the cable around one of the shelter posts or an eye hook to a post.

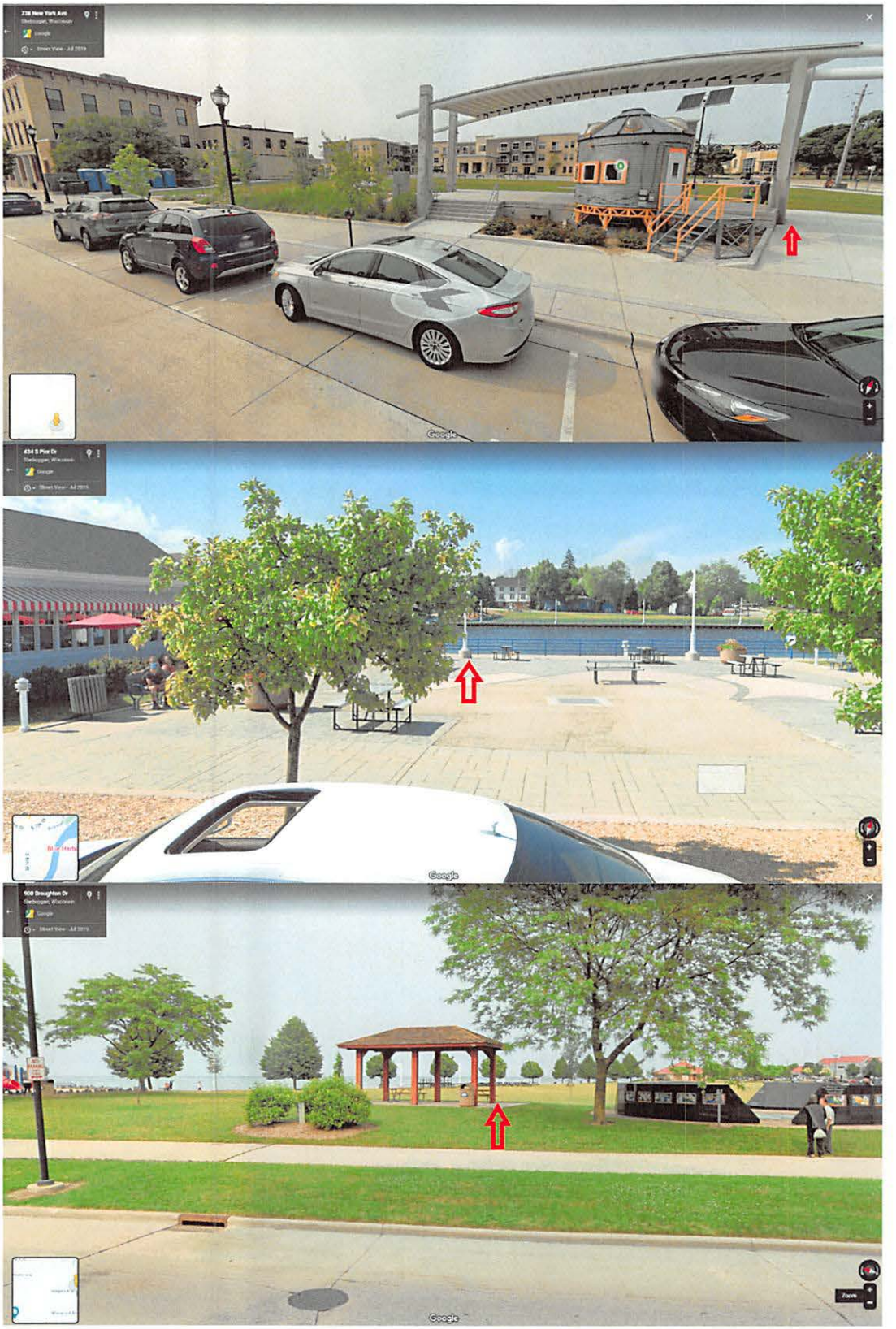
6. 501-509 N. 8th St., Sheboygan. This is a vacant lot I own, and donate to the Kohler Art Center for an art feature. The piano would be secured to the side wall via an eyehook tapcon.

If you need more ideas for locations, let me know.
Toby

Dr. Toby Watson
2808 Kohler Memorial Drive, Suite 1
Sheboygan, WI 53081

920-918-7377







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