# Wauwatosa, WI

## Board of Public Works

## Meeting Agenda

7725 W. North Avenue
Wauwatosa, WI 53213

**Tuesday, January 16, 2024** **8:30 AM** **Zoom Only: https://servetosa.zoom.us/j/89415047159, Meeting ID: 894 1504 7159**

**Regular Meeting**

**VIRTUAL MEETING INFORMATION**

Members of the public may observe and participate in the meeting in-person or via Zoom at the link above. To access the Zoom meeting via phone, call 1-312-626-6799 and enter the Meeting ID.

**CALL TO ORDER**

**ROLL CALL**

**APPROVAL OF MINUTES**

**1.** Approval of Minutes from the December 18, 2023 regular meeting **24-0001**

**NEW BUSINESS**

**1.** Request by Nick Carnahan of Galbraith Carnahan Architects on behalf of DAPK LLC for an interior landscaping code variance at 6330 W. North Avenue **24-0009**

**2.** Request by Nick Carnahan of Galbraith Carnahan Architects on behalf of DAPK LLC for an encroachment at 6330 W. North Avenue **24-0010**

***Recommendation:*** Common Council

**3.** Request for the acceptance of a Non-Motorized Multi-Use Pedestrian Trail Easement Agreement at 3029 N. 112th Street **23-1375**

***Recommendation:*** Common Council

**4.** Request for approval of plans and specifications for Contract 24-60, Project 8036, Muellner Building Renovation **24-0035**

**5.** Consideration of request by Director of Public Works for the acceptance of a permanent water main easement for the installation of a water main at 931-937 N. 123rd Street **24-0038**

***Recommendation:*** Common Council

**6.** Monthly Pumpage Report November 2023 **23-1358**

**7.** Acceptance of donation of remaining portion of Schoonmaker Reef National Historic Landmark to the City of Wauwatosa from Wangard Partners, LLC via quitclaim deed **24-0064**

***Recommendation:*** Common Council

**8.** Consideration of ratification of project partial payments for work completed pursuant to the terms of the contract **24-0002**

**9.** Project Updates **24-0003**

## ADJOURNMENT

NOTICE TO PERSONS WITH A DISABILITY
Persons with a disability who need assistance to participate in this meeting should call the City Clerk's office at (414) 479-8917 or send an email to tclerk@wauwatosa.net, with as much advance notice as possible.

# Wauwatosa, WI

## Staff Report

**File #:** 24-0009 **Agenda Date:** 1/16/2024 **Agenda #:** 1.

Request by Nick Carnahan of Galbraith Carnahan Architects on behalf of DAPK LLC for an interior landscaping code variance at 6330 W. North Avenue

**Submitted by:**
Jennifer Stilling
**Department:**
Public Works (Engineering Division Services)

### A. Issue

The applicant has requested that the Board consider a variance for the proposed interior vehicular use area landscaping (Code Reference 24.12.030).

### B. Background/Options

Because the parking lot for this parcel is proposed to be restriped differently from the last approved parking lot plan from 2006, the perimeter and interior landscape requirements in Code Section 24.12 apply. The proposed redevelopment is meeting the required perimeter landscaping requirement.

Code section 24.12.030 states that at least 10% of the interior of vehicular use areas must be landscaped. In addition to the 10% landscape area, one shade tree is required per 180 square feet of required landscape area.

The proposed landscaping plan shows a vehicular use area of 3,409 square feet. Per the Code, 341 square feet should be included with two trees. The proposed plan does not provide any interior landscaping. Therefore, the request is for 100% deficiency for both the area and the required number of trees.

Per the zoning code, variances shall meet the following criteria.
1) Exceptional circumstances exist pertaining to the subject lot;
2) That the requested variance is necessary for the preservation and enjoyment of the property rights possessed by the other properties in the district and vicinity;
3) That the variance will not create special detriment to the adjacent property and not materially impair or be in contrary to the purpose and spirit of this ordinance or to the public interest; and
4) That the difficulty or hardship was not created by the property owner.

The applicant has provided a memorandum include in the agenda packet that provides variance justification based on the criteria listed above.

Previous variances to the landscape requirements have offered mitigation that is in proportion to the deficiency they are requesting relief from. For example, if the applicant is deficient by 4 trees, 4 trees are provided adjacent to the parking area that will shade the parking area and meet the intent of the code. This application does not

offer any form of mitigation for the deficiencies.

According to the Zoning Code, for a new C1 zoned building of this size, a total of 24 parking spaces would be required. The previously approved 2006 site plan included 13 parking spaces
Based on the site plan that was included in the Conditional Use application for this proposed use, 8 parking spaces were to be provided and the plans currently show 8 parking spaces. The proposed redevelopment is not required to meet the same parking requirements as a new building because the proposal includes the re-use of an existing building.

The proposed parking lot is less than what was previously approved in 2006 due to the addition of perimeter landscaping along the west side of the parking lot, a loading dock for box truck deliveries at the southeast corner of the parking lot, and screened trash enclosures along the east side of the parking lot. Compliance with the interior landscaping code may further impact the number of parking stalls and/or the functionality of the parking lot, proposed loading dock, and proposed trash enclosures. If a reduction in parking spaces is required to meet landscaping code, either a parking variance would need to be applied for through the Board of Public Works or a new Conditional Use would be required.

## C. Strategic Plan (Area of Focus)

Economic development and financial resilience.

## D. Fiscal Impact

No fiscal impact to the City of Wauwatosa.

## E. Recommendation

It is up to the Board to determine if the applicant has met the variance criteria based on the zoning code. It is staff's opinion that approval of the variance could be granted because of the following reasons:

- Re-use of the existing building and parking lot limits the ability to include interior parking lot landscaping.
- The proposed parking lot count (8) is less than what zoning would require for a similarly sized new building (24) and the previously approved parking lot plan (13).

# Board of Public Works Application

City of Wauwatosa
7725 West North Avenue
Wauwatosa, WI 53213
414-479-8907
www.wauwatosa.net

***Property Information***

Project Address: 6330 W. North Avenue, Wauwatosa WI 53213

***Applicant or Agent Information***

Name Nick Carnahan

Company Galbraith Carnahan Architec

Address 6404 W. North Ave.

City Wauwatosa State WI Zip 53213

Phone 414-291-0772

Email nac@galbraithcarnahan.com

***Property Owner Information***

Name Dave Tamburrino

Company DAPK LLC

Address 2463 N. 67th Street

City Wauwatosa State WI Zip 53213

Phone 414-731-4525

Email davetambo@yahoo.com

## APPLICATION TYPE

All fees are $100 unless noted.

- ☐ Encroachment
- ☐ Air Condenser Location
- ☐ Well abandonment
- ☐ City Co-Location
- ☐ Swimming Pool Location
- ☐ Property Maintenance Appeal
- ☑ Landscape Appeal
- ☐ Neighborhood Association Signs
- ☐ Extension of Work Hours
- ☐ Other
- ☐ Site Plan Appeal
- ☐ Commercial Fence Appeal
- ☐ ROW Construction Staging
- ☐ Parking Exception **$150**

*Make checks payable to: City of Wauwatosa*

***This application must be completed and filed with the Development Office and is required for Board of Public Works review.***

***Proposed Request-*** Specify reason for petition and what particular hardships are involved. Examples: insufficient lot area, insufficient front, side or rear setback, placement of equipment would decrease efficiency, etc.

See attached memorandum.

Applicant or Agent Signature: Nick Carnahan Digitally signed by Nick Carnahan Date: 2023.12.14 15:35:58 -06'00' Date: 12-14-23

**FOR CITY USE ONLY:**

Accepted by _____

Date _____

Zoning District _____

Aldermanic District _____

MT# _____

Fee

Amount Paid _____

Receipt # _____

Date paid _____

Updated December 2021

Meeting Dates

BPW _____

Council _____

Other _____

(over)

## ***BOARD OF PUBLIC WORKS APPLICATION DEADLINES***

| **APPLICATION DEADLINE** | **BOARD OF PUBLIC WORKS @ 8:30 AM** |
|---|---|
| January 5, 2023…… | January 17, 2023 (Tuesday) |
| January 26, 2023…… | February 6, 2023 |
| February 9, 2023 …… | February 20, 2023 |
| February 23, 2023…… | March 6, 2023 |
| March 9, 2023 …… | March 20, 2023 |
| March 23, 2023 …… | April 3, 2023 |
| April 6, 2023 …… | April 17, 2023 |
| April 20, 2023 …… | May 1, 2023 |
| May 4, 2023 …… | May 15, 2023 |
| May 25, 2023 …… | June 5, 2023 |
| June 8, 2023 …… | June 20, 2023 (Tuesday) |
| June 22, 2023 …… | July 3, 2023 |
| July 6, 2023 …… | July 17, 2023 |
| July 20, 2023 …… | July 31, 2023 |
| August 24,2023 …… | September 5, 2023 (Tuesday) |
| September 7, 2023 …… | September 18, 2023 |
| September 21, 2023 …… | October 2, 2023 |
| October 5, 2023 …… | October 16, 2023 |
| October 26, 2023 …… | November 6, 2023 |
| November 9, 2023 …… | November 20, 2023 |
| November 22, 2023…… | December 4, 2023 |
| December 7, 2023 …… | December 18, 2023 |
| December 21, 2023…… | January 2, 2024 (Tuesday) |
| January 4, 2023…… | January 16, 2024 (Tuesday) |

*See handout for complete approval process



(over)

GALBRAITH CARNAHAN ARCHITECTS

**RE: LANDSCAPE ZONING VARIANCE**

January 4th 2024

Idyll Coffee Roasters
6330 W. North Avenue
Wauwatosa WI 53213

## ZONING VARIANCE BEING SOUGHT

***24.12.030.B.2 – Interior Vehicular Use Area Landscaping.*** *"Minimum Interior Landscape Area. At least 10% of the interior of vehicular use areas must be landscaped."*

## PROJECT DESCRIPTION

The project under consideration is the conversion of the long vacant building at 6330 W. North Avenue into a café and accessory coffee roasting facility.

The design utilizes the bones of the 1963 structure existing on the site to create a vibrant neighborhood hub and gathering place. Substantial improvements are being done to the property including a dramatic re-working of the most visible North Avenue façade.

Behind the existing building, the parking lot will remain largely unchanged from its footprint, traffic flow, and capacity. The parking lot has existed in relatively the same configuration for 60 years. We are introducing landscaping edges along the West and North boundaries of the lot to comply with some of the recently adopted landscape zoning.

## EXCEPTIONAL CIRCUMSTANCE

The building and associated site at 6330 W. North Avenue is a unique and exceptional circumstance within the City of Wauwatosa.

- The structure located on the site has been either city or county owned for an excess of 10 years. During this tenure, the structure has suffered from a lack of roof maintenance, illegal salvaging of metal building components, and the termination of electrical and gas service. The structure presents a significant blight on the neighborhood that Idyll Coffee Roasters is attempting to rectify.



6404 West North Avenue, Wauwatosa, Wisconsin 53213 ▪ PHONE: (414) 291-0772 ▪ WEB: www.galbraithcarnahan.com

- The site was developed during the 1920's streetcar suburb area. The urban texture of this area is significantly different than the Bluemound Rd. / Mayfair Rd. section of Wauwatosa where the landscape zoning is more appropriately calibrated. In a tight urban context like East Tosa or The Village, the landscaping zoning often requires variances to respond in a logical, designed manner to the circumstances of the site.

- In the pre 1950 sections of Wauwatosa the parking zoning and landscape zoning are almost impossible to satisfy mutually. Both sections of zoning are written in the mold of the Bluemound Rd. / Mayfair Rd. corridors in mind and are essentially unworkable in East Tosa or the Village.

- The site, prior to 1963, was a filling station which led to significant underground contamination on the site. An underground leaded gasoline storage tank was removed from under the existing asphalt parking lot and remediation was done to the soils surrounding that area.

- While DNR closure has been established for the site, pollutants do remain at elevated levels in the soil and any work on the property is subject to the DNR's requirements for continuing obligations. Any soils removed from the site must be tested and properly remediated when removed. This presents a significant financial challenge to creating landscape islands that other properties in the area do not have.

- Lastly, given the residual contamination on the site localized along the eastern edge of the site, we have concerns with rainwater infiltrating into that area and potentially spreading contaminants below the surface. The most prudent course of action in the areas on the east 2/3 of the site would be to maintain the status quo with an impervious asphalt paving over that section. Our goal in the parking area is to collect the water as quickly, and cleanly as possible and deliver it to the storm sewer to evacuate it from the site.



■ 6404 West North Avenue , Wauwatosa, Wisconsin 53213 ■ PHONE: (414) 291-0772 ■ WEB: www.galbraithcarnahan.com ■

## PRESERVATION AND ENJOYMENT

The zoning variance being sought would preserve the use at 6330 W. North Avenue enjoyed by the surrounding properties.

- Most adjacent properties do not have the contamination issues present at 6330 W. North Avenue. Compliance with the zoning for interior landscape islands does not typically present the financial hardship or exposure to potential future environmental risk that is present on the site.
- This variance also preserves the enjoyment of rights that the existing 60-year-old parking lot had prior to the recent enactment of the revised landscaping zoning.

## DETRIMENT AND IMPAIRMENT

The zoning variances being sought would avoid detriments and impairments to the adjacent properties.

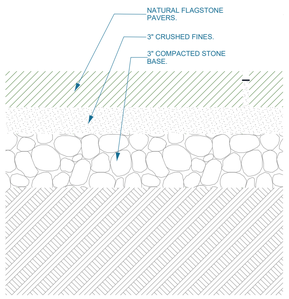
- By reducing the amount of water infiltrated at the back of the project site, the risk of residual contamination moving across property lines is subsequently reduced.0
- The area in question is located internally to the site and does not have the same impact on the surrounding properties that perimeter screening has.
- The variance simply preserves the 60-year status quo at the site and does not impose any changes that would adversely affect any of the property owners in the neighborhood.
- The granting of this variance would retain the turning radius out of the parking lot into the alleyway. With small box truck deliveries utilizing this parking exit, the variance will help to prevent potential safety and property issues arising out of an inadequate turning radius at this location

## INHERENT HARDSHIP

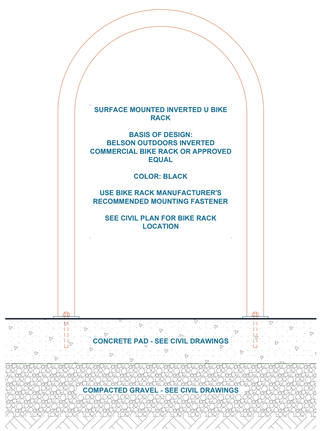
Idyll Coffee Roasters did not create the hardships associated with these this variance. The need for the variance stems from the fortunate redevelopment of long blighted corner of East Tosa. The building and parking lot at 6330 W. North Avenue, was designed in a different time and brings with it a legacy of contamination that precedes even the circa 1963 building. If we were to have a clean site at this corner and been tasked with designing a new café for this location, we would have been able to comply with the requirements of the landscape zoning easily and willingly. In order to sensitively rehabilitate this building and site however there is a necessity for flexibility in the landscape zoning.



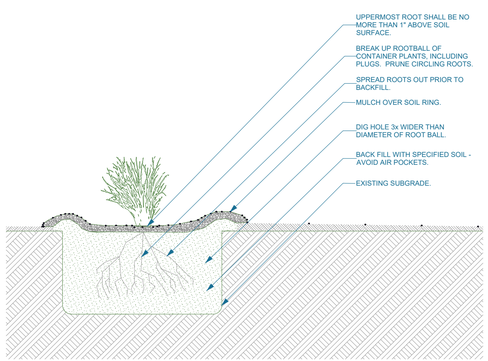
■ 6404 West North Avenue, Wauwatosa, Wisconsin 53213 ■ PHONE: (414) 291-0772 ■ WEB: www.galbraithcarnahan.com ■



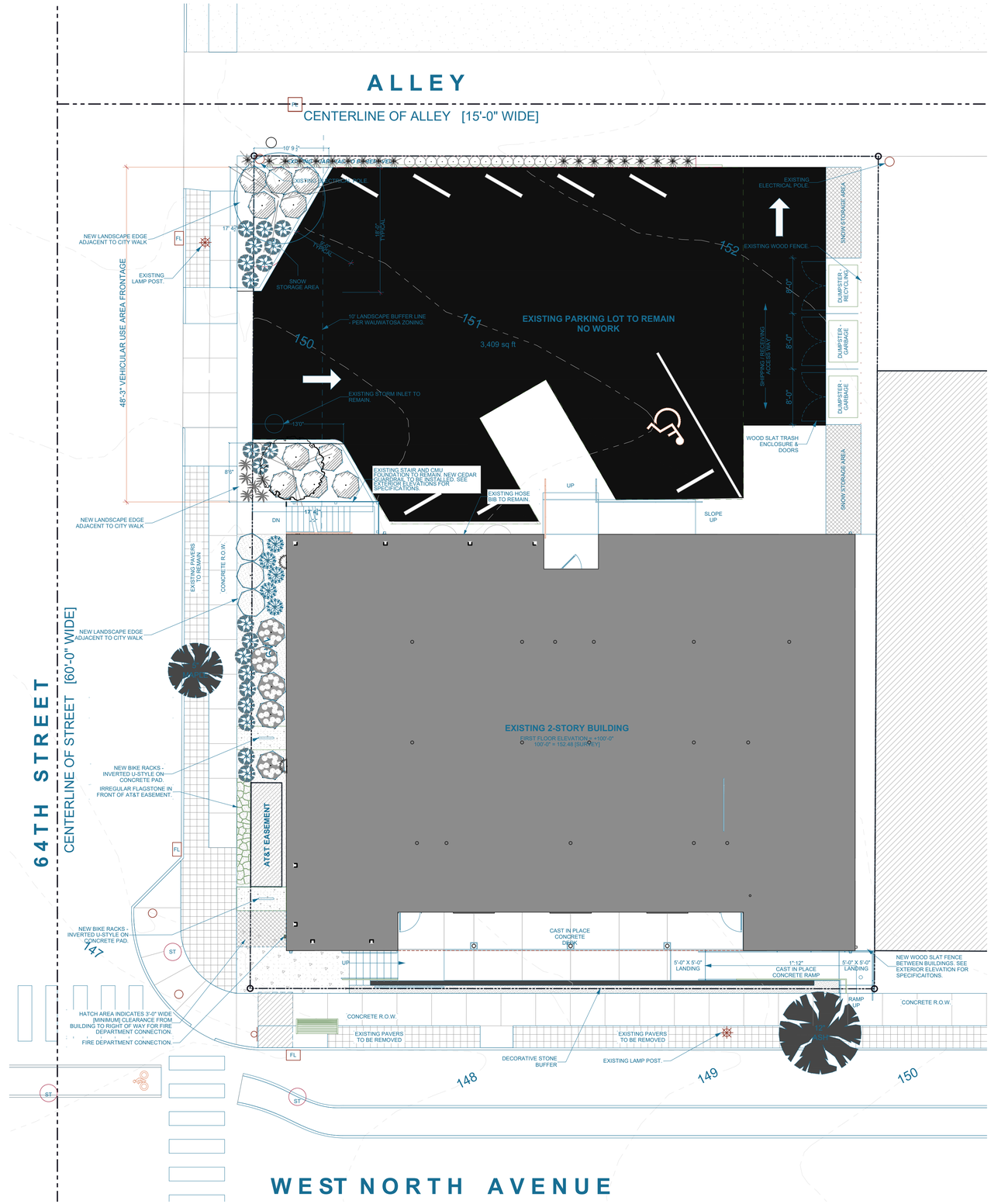

2 A001 FIELD STONE PAVERS
SCALE: 3" = 1'-0"




3 A001 BIKE RACK
SCALE: 1 1/2"= 1'-0"




4 A001 PLANTING DETAIL
NOT TO SCALE




1 A001 ARCHITECTURAL LANDSCAPE PLAN
SCALE: 1/8" = 1'-0"

## SITE DATA TABLE

**TAX KEY:** 330-0171-000

**ZONING =** C1 / NOR

**PERIMETER VEHICLE USE AREA (LENGTH)=** 48'-2 1/2" L.F.

PERIMETER VEHICLE USE AREA (AREA) = 4,152 S.F.

**NEW TREES - PARKING AREA =** 0

**NEW BUSHES - PARKING AREA =** 0

## PLANTINGS LEGEND

**SCIENTIFIC NAME:** OSTRYA VIRGINI/
**COMMON NAME:** IRONWOOD
**ROOT TYPE:** 2.5" CALIPER, B&B
**ESTABLISHED HEIGHT:** 15' TO 20'

**SCIENTIFIC NAME:** MALUS SARGENT
**COMMON NAME:** TINA SARGENT CRa
**ROOT TYPE:** 2" CALIPER, B&B
**ESTABLISHED HEIGHT:** 8' TO 10'

**SCIENTIFIC NAME:** RHUS AROMATICA 'GRO-LOW'
**COMMON NAME:** GRO-LOW SUMAC
**ROOT TYPE:** #3 CONTAINER
**ESTABLISHED HEIGHT:** 1.5' TO 2'

**SCIENTIFIC NAME:** DIEVILLA LONICERA
**COMMON NAME:** DWARF BUSH HONEYSUCKLE
**ROOT TYPE:** #3 CONTAINER
**ESTABLISHED HEIGHT:** 3' TO 4'

**SCIENTIFIC NAME:** HYDRANGEA PANICULATA 'LITTLE QUICKFIRE'
**COMMON NAME:** LITTLE QUICKFIRE HYDRANGEA
**ROOT TYPE:** #3 CONTAINER
**ESTABLISHED HEIGHT:** 4' TO 5'

**SCIENTIFIC NAME:** PANICUM VIRGATUM 'NORTHWIND'
**COMMON NAME:** NORTHWIND SWITCH GRASS
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 3'

**SCIENTIFIC NAME:** SPOROBOLUS HETEROLEPIS 'TARA'
**COMMON NAME:** TARA PRAIRIE DROPSEED
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 1'

**SCIENTIFIC NAME:** SCHIZACHYRIUM SCOPARIUM 'STANDING OVATI
**COMMON NAME:** STANDING OVATION LITTLE BLUESTEM
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 1'-6"

**SCIENTIFIC NAME:** RUSSIAN SAGE 'LITTLE SPIRE'
**COMMON NAME:** LITTLE SPIRE RUSSIAN SAGE
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 1'-6"

**SCIENTIFIC NAME:** ALLIUM 'SUMMER BEAUTY'
**COMMON NAME:** ORNAMENTAL ONION
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 1'-6"

**SCIENTIFIC NAME:** CLEMATIS TERNIFLORA 'SWEET AUTUMN'
**COMMON NAME: SWEET AUTUMN CLEMATIS**
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 6-7'

## SITE DATA TABLE

| | |
|---|---|
| VEHICULAR USE AREA: | 3,409 SF. |
| PERIMETER LANDSCAPED AREA: | 345 S.F. / 11.3% |
| VEHICULAR USE AREA FRONTAGE: | 48'-3" |
| REQUIRED PERIMETER LANDSCAPING | |
| DECIDUOUS TREES: | 2 TOTAL |
| SHRUBS: | 8 TOTAL |
| INTERIOR LANDSCAPED AREA: | 0 S.F. / 0% |

## SOIL COMPACTION – GENERAL REQ.

THE FOLLOWING PARAMETERS SHALL DEFINE THE GENERAL DESCRIPTION OF THE THRESHOLD POINTS OF SOIL COMPACTION IN EXISTING, MODIFIED, OR INSTALLED SOIL AND SUBSOIL.

1. ACCEPTABLE COMPACTION: GOOD ROOTING ANTICIPATED, BUT INCREASING SETTLEMENT EXPECTED AS COMPACTION IS REDUCED AND/OR IN SOIL WITH A HIGH ORGANIC MATTER CONTENT.
   A. BULK DENSITY METHOD - VARIES BY SOIL TYPE.
   B. STANDARD PROCTOR METHOD - 75-85%; SOIL BELLOW 75% IS UNSTABLE AND WILL SETTLE EXCESSIVELY.
   C. PENETRATION RESISTANCE METHOD - ABOUT 75-250 PSI, BELOW 75 PSI SOIL BECOMES INCREASINGLY UNSTABLE AND WILL SETTLE EXCESSIVELY.

2. ROOT LIMITING COMPACTION: ROOT GROWTH IS LIMITED WITH FEWER, SHORTER AND SLOWER GROWING ROOTS.
   A. BULK DENSITY METHOD - VARIES BY SOIL TYPE
   B. STANDARD PROCTOR METHOD - ABOVE APPROXIMATELY 85%
   C. PENETRATION RESISTANCE METHOD - ABOUT 300 PSI.

3. EXCESSIVE COMPACTION: ROOTS NOT LIKELY TO GROW BUT CAN PENETRATE SOIL WHEN SOIL IS ABOVE FIELD CAPACITY.
   A. BULK DENSITY METHOD - VARIES BY SOIL TYPE.
   B. STANDAR PROCTOR METHOD - ABOVE 90%.
   C. PENETRATION RESISTANCE METHOD - APPROXIMATELY ABOVE 400 PSI.

## PLANTING MEDIA – GENERAL REQ.

SOIL USED ON THE PROJECT MUST ADHERE TO THE FOLLOWING REQUIREMENTS:

1. THE SOIL MIX MIX MUST BE UNIFORM AND FREE OF STONES, STUMPS ROOTS OR OTHER SIMILAR MATERIAL GREATER THAN 2 INCHES IN DIAMETER.

2. THE PH SHOULD BE BETWEEN 4.5 AND 7.0. IF THE PH FALLS OUTSIDE OF THIS RANGE, IT MAY BE MODIFIED WITH LIME TO INCREASE THE PH OR IRON SULFATE AND SULFER TO LOWER THE PH. THE LIME OR IRON SULFATE MUST BE MIXEDD UNIFORMLY INTO THE SOIL PRIOR TO USE.

3. TOPSOIL STOCKPILE LOCATION (IF USING ON-SITE SOILS) OR SOURCE OF TOPSOIL IF IMPORTED TO THE SITE. SOIL ANALYSIS FOR ALL TOPSOIL TO BE UTILIZED PRIOR TO PLACEMENT.

## LANDSCAPE PLAN - GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR CONTACTING PUBLIC AND PRIVATE UNDERGROUND UTILITY LOCATION SERVICE TO HAVE SITE MARKED PRIOR TO ANY DIGGING OR EARTHWORK.

2. ANY AREAS DISTURBED BY CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION.

3. TOPSOIL SHOULD BE PLACED TO WITHIN 3" OF FINISH GRADE BY THE GENERAL / GRADING CONTRACTOR DURING ROUGH GRADING OPERATIONS. THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FINE GRADING OF ALL LANDSCAPED AREAS. A MINIMUM DEPTH OF 3" OF BLENDED, PREPARED, AND NON-COMPACTED TOPSOIL IS REQUIRED FOR ALL SEEDED AREAS. FINISH LANDSCAPED AREAS TO BE SMOOTH, UNIFORM, AND PROVIDE POSITIVE DRAINAGE AWAY FROM ALL STRUCTURES AND PAVEMENT.

GCA_logo+type_small 7807768S.jpg

6404 West North Avenue
Milwaukee, Wisconsin 53213
(414) 291-0772 phone
www.galbraithcarnahan.com

CONSULTANTS:

LANDWORKS landscape services
LandWorks Inc.
N69W25195 Indian Gass Ln.
Sussex, WI 53089
(262)-820-2501

Drawn by: Evan Kasper
Checked by: Samantha Carlson,PLA

# IDYLL COFFEE

6330 W. NORTH AVENUE
WAUWATOSA, WI 53213
TAX KEY: 330-0171-000

| DRAWING ISSUE | DATE |
|---|---|
| EXISTING BASE PLANS | 10.20.22 |
| PRE-APPLICATION DRAWINGS | 05.17.23 |
| CONDITIONAL USE / SITE PLAN APPLICATION | 06.06.23 |
| 50% CD'S | 08.24.23 |

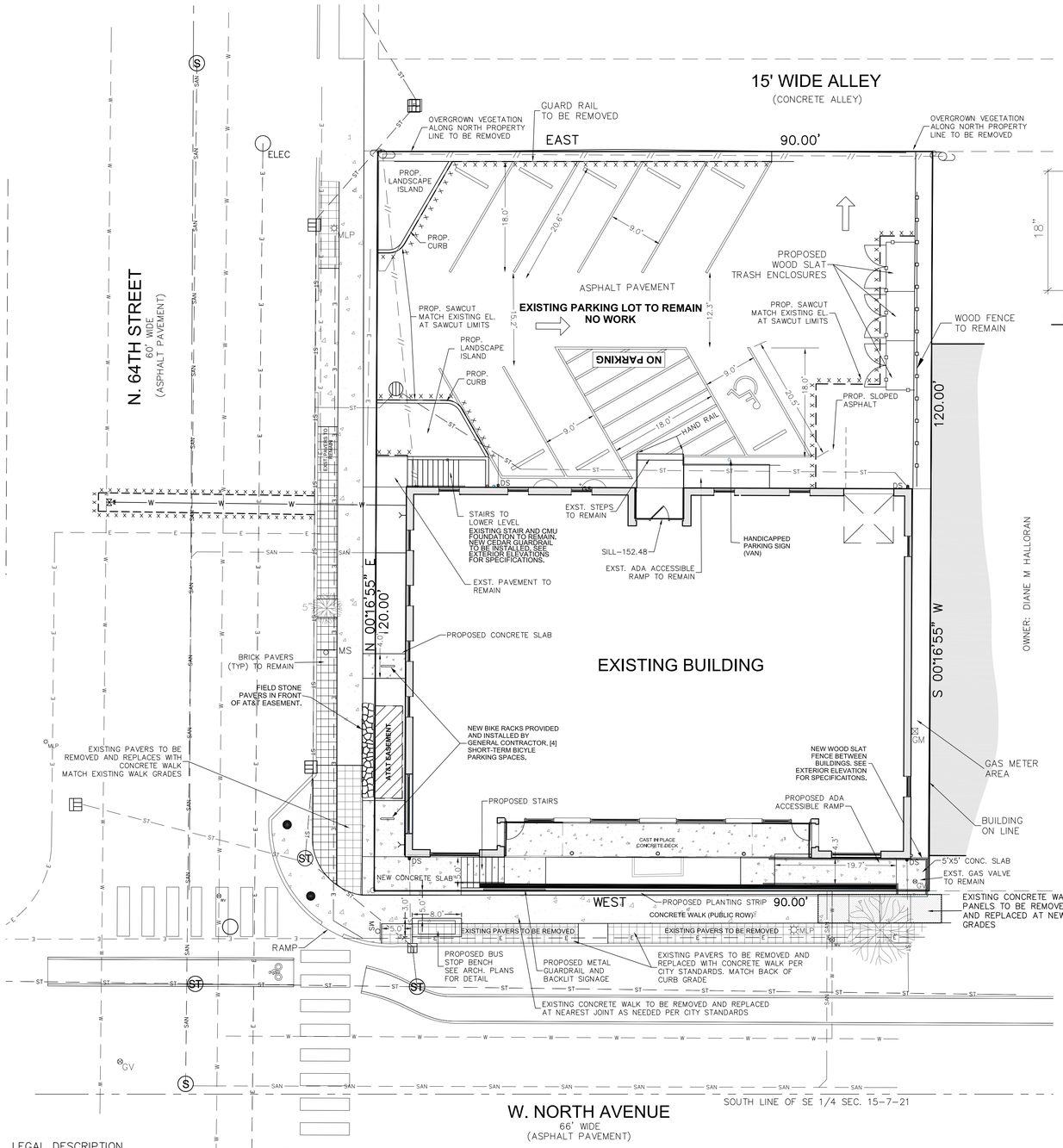
PROJECT # 22.38

ARCHITECTURAL LANDSCAPE PLAN

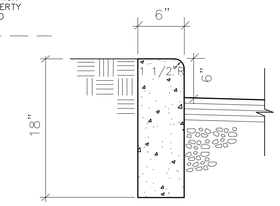
A001

NOT FOR CONSTRUCTION

© 2023 GALBRAITH CARNAHAN ARCHITECTS LLC

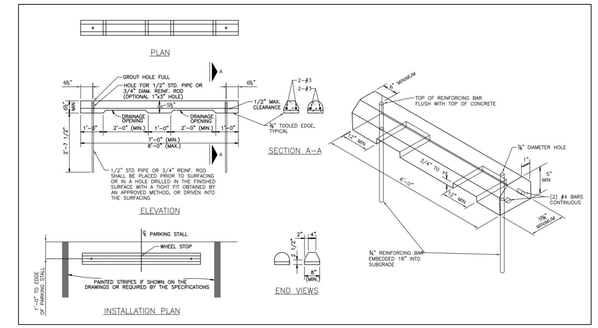



OWNER: DIANE M HALLORAN



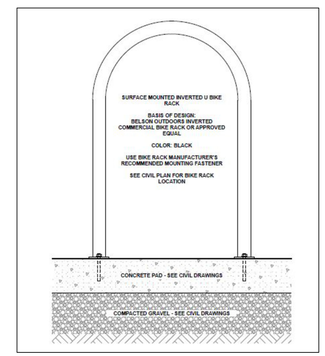

CONCRETE CURB DETAIL

NOT TO SCALE



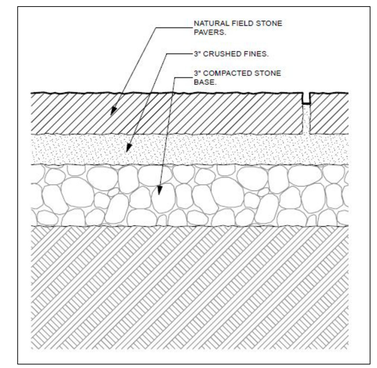

CONCRETE WHEEL STOP DETAIL

NOT TO SCALE



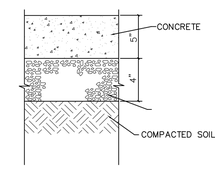

BIKE RACK

NOT TO SCALE



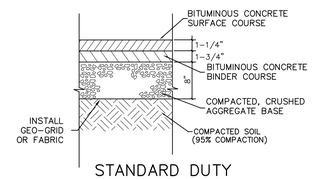

FIELD STONE PAVERS

NOT TO SCALE



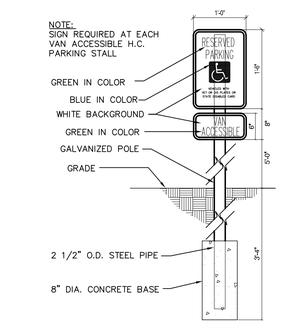

CONCRETE SIDEWALK

NOT TO SCALE




STANDARD DUTY ASPHALT PAVEMENT (PARKING AREA)

NOT TO SCALE




HANDICAPPED PARKING SIGN DETAIL (VAN ACCESSIBLE)

NOT TO SCALE

CJ engineering
civil design and consulting
9205 W. Center Street
Suite 214
Milwaukee, WI 53222
PH. (414) 443-1312
FAX (414) 443-1317
www.cj-engineering.com

# IDYLL COFFEE

TAX KEY: 3300171000

6330 W. NORTH AVENUE WAUWATOSA, WI

## LEGAL DESCRIPTION

LOTS 22, 23, AND 24, IN BLOCK 3, IN J.F. LABOULE SUBDIVISION NO. 1, IN THE SOUTHEAST 1/4 OF SECTION 15, IN TOWNSHIP 7 NORTH, RANGE 21 EAST, IN THE CITY OF WAUWATOSA, COUNTY OF MILWAUKEE, STATE OF WISCONSIN.

CONTAINING: 10,800 S.F. (0.25 ACRES)

## NOTES:

1. DISTURBED AREA = 2,022 S.F. (0.046 ACRES)
2. THERE IS AN INCREASE OF 78 S.F. OF IMPERVIOUS SURFACE ON THE SITE.
3. TAX ID NUMBERS: 3300171000
4. ALL WORK IN THE RIGHT OF WAY SHALL BE DONE IN ACCORDING TO THE CITY REQUIREMENTS AND SPECIFICATIONS AND REQUIRES A STREET OCCUPANCY PERMIT FROM THE CITY.
5. PAVEMENT MARKINGS SHALL BE 3" WIDE STRIPED IN WHITE OR YELLOW TRAFFIC PAINT.
6. PROPOSED DEVELOPMENT WILL NOT DISTURB MORE THAN 1 ACRE AND WILL INCREASE THE AMOUNT OF IMPERVIOUS SURFACE BY 78 S.F. THEREFORE A STORM WATER MANAGEMENT PLAN IS NOT REQUIRED.

SITE AREAS: EXISTING

PROPERTY AREA = 10,800 S.F. (0.248 ACRES)

EXISTING BUILDING = 4,767 S.F. (0.109 ACRES)
EXISTING PAVEMENT = 5,166 S.F. (0.119 ACRES)

EXISTING IMPERVIOUS = 9,933 S.F. (0.228 ACRES)
EXISTING OPEN = 867 S.F. (0.020 ACRES)

EXISTING DESIGNATED ON SITE SURFACE PARKING (TO BE RESTRIPED)
8 REGULAR STALLS
1 ADA ACCESSIBLE STALL
9 TOTAL PARKING STALLS

0 BIKE PARKING STALLS

SITE AREAS: PROPOSED

PROPOSED BUILDING FOOTPRINT = 4,271 S.F. (0.098 ACRES)
PROPOSED PAVEMENT = 5,740 S.F. (0.138 ACRES)

PROPOSED IMPERVIOUS = 10,011 S.F. (0.236 ACRES)
PROPOSED OPEN = 789 S.F. (0.012 ACRES)

PROPOSED ON SITE SURFACE PARKING:
7 REGULAR STALLS
1 ACCESSIBLE STALL
8 TOTAL STALLS

4 SHORT TERM BIKE PARKING STALLS
2 LONG TERM BIKE PARKING STALLS (SEE ARCHITECTURAL PLANS FOR INTERIOR LOCATION)

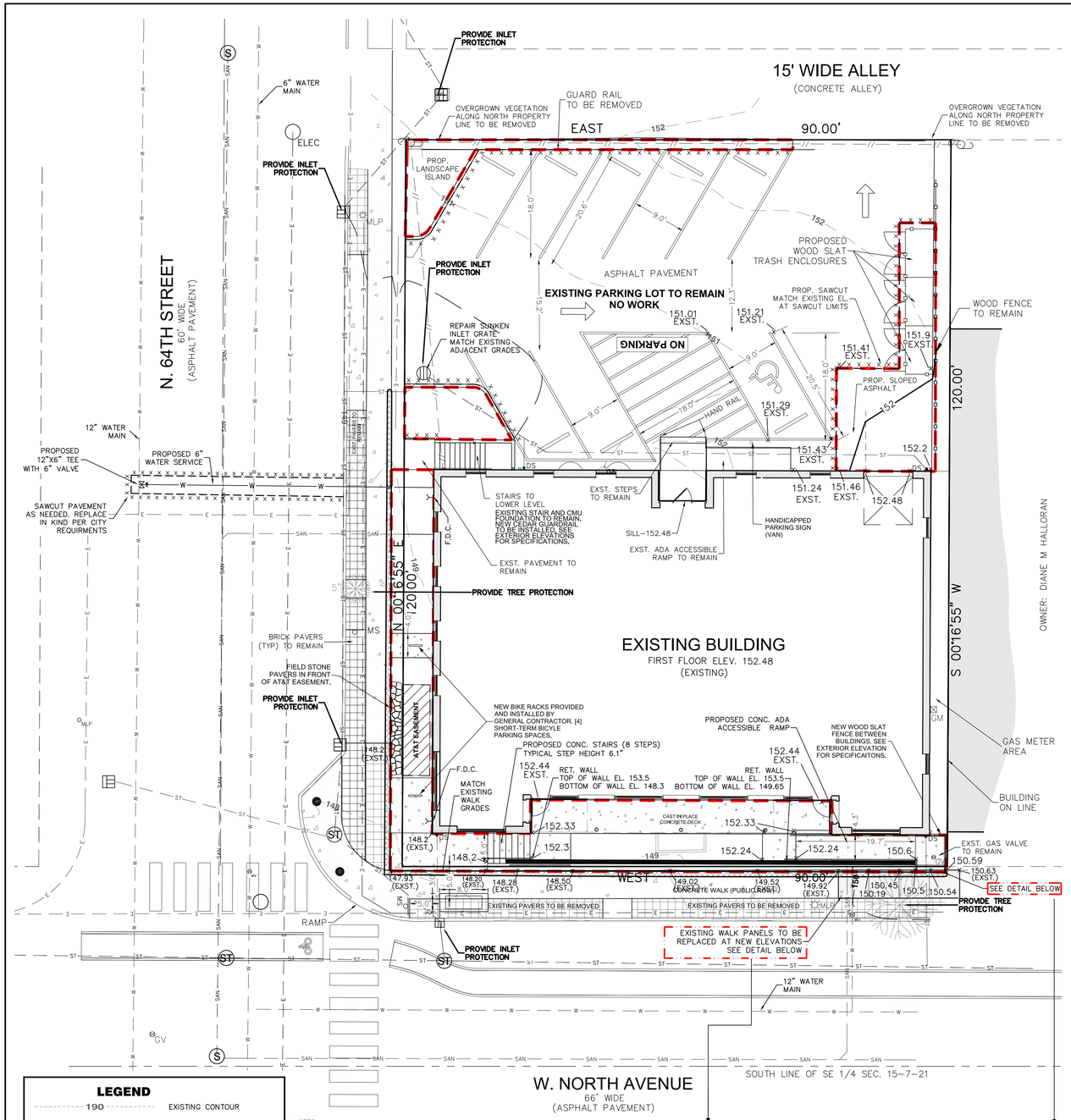
GRAPHIC SCALE

10 0 5 10 20

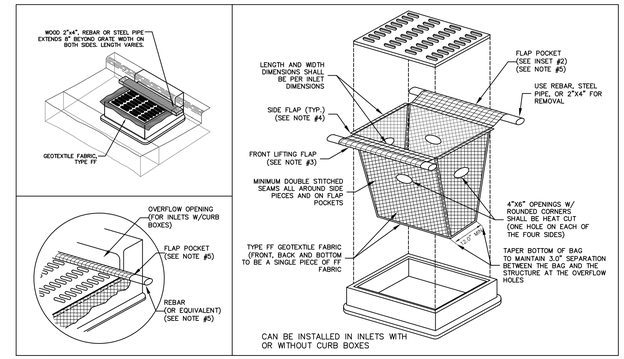
1 inch = 10 ft

CJE NO.: 2342R4
AUGUST 24, 2023
REV.:09/07/23
REV.:11/01/23
REV.:12/05/23
REV.:01/02/24

# SITE PLAN C1.0




OWNER: DIANE M HALLORAN



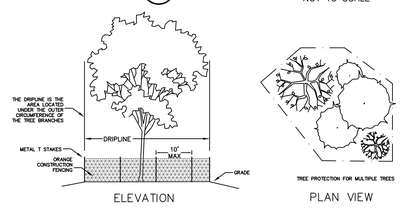

NOTES:
1. TAPER BOTTOM OF BAG TO MAINTAIN THREE INCHES OF CLEARANCE BETWEEN THE BAG AND THE STRUCTURE, MEASURED FROM THE BOTTOM OF THE OVERFLOW OPENINGS TO GHT STRUCTURE WALL.
2. GEOTEXTILE FABRIC TYPE FF FOR FLAPS, TOP AND BOTTOM OF OUTSIDE OF FILTER BAG. FRONT, BACK AND BOTTOM OF FILTER BAG BEING ONE PIECE.
3. FRONT LIFTING FLAP IS TO BE USED WEN REMOVNG AND MAINTAINING FILTER BAG.
4. SIDE FLAPS SHALL BE A MAXIMUM OF TWO INCHES LONG. FOLD THE FABRIC OVER AND REINFORCE WITH MULTIPLE STITCHES.
5. FLAP POCKETS SHALL BE LARGE ENOUGH TO ACCEPT WOOD 2"X4". THE REBAR, STEEL PIPE, OR WOOD SHALL BE INSTALLED IN THE REAR FLAP AND SHALL NOT BLOCK THE TOP HALF OF THE CURB FACE OPENING.

MAINTENANCE NOTES:
1. WHEN REMOVING OR MAINTAINING INLET PROTECTION, CARE SHALL BE TAKEN SO THAT THE SEDIMENT TRAPPED IN THE FABRIC DOES NOT FALL INTO THE STRUCTURE. MATERIAL THAT HAS FALLEN INTO THE INLET SHALL BE IMMEDIATELY REMOVED.

## INLET PROTECTION, TYPE D

3 PER WDNR TECHNICAL STANDARD 1060

NOT TO SCALE




NOTES:
1. INSTALL 4' HIGH ORANGE VINYL SNOW/CONSTRUCTION FENCING OR SIMILAR FENCING AT OR BEYOND THE DRIPLINE OF ALL TREES TO BE SAVED
2. ERECT FENCE WITH 5' METAL T-STAKED AT LEAST EVERY 10'
3. THE FENCING SHALL BE IN PLACE BEFORE CONSTRUCTION ACTIVITY BEGINS AND REMAIN UNTIL ALL EXTERIOR WORK HAS BEEN COMPLETED.
4. NO CONSTRUCTION ACTIVITY SHALL TAKE PLACE NOR SHALL ANY EQUIPMENT BE STORED INSIDE THE FENCING
5. TO THE GREATEST EXTENT POSSIBLE, CONTRACTORS SHALL BE RESPONSIBLE FOR EXERCISING GREAT CARE TO RETAIN AND PROTECT ALL EXISTING TREES

## TREE PROTECTION

4 NOT TO SCALE

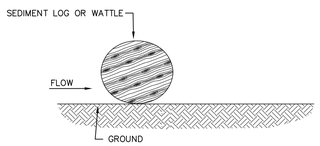
## EROSION CONTROL PRACTICES SCHEDULE

1. SILT WATTLES
2. CONSTRUCTION PAD
3. INLET PROTECTION
4. TREE PROTECTION

CJ engineering
civil design and consulting
9205 W. Center Street
Suite 214
Milwaukee, WI 53222
PH. (414) 443-1312
FAX (414) 443-1317
www.cj-engineering.com

## CONSTRUCTION SCHEDULE

1. OBTAIN PLAN APPROVAL AND OTHER APPLICABLE PERMITS.
2. INSTALL INLET GRATE SCREENS IN THE EXISTING CATCH BASINS ON AND ADJACENT TO SITE.
3. INSTALL SEDIMENT LOG (WATTLE) OR SILT FINECE AS SOON AS FEASIBLE.
4. DEMO EXISTING PAVEMENT AND BUILDING TO BE REMOVED
5. UTILIZE EXISTING DRIVEWAY AS CONSTRUCTION ENTRANCE/EXIT.
6. ROUGH GRADE PROJECT AREA AS NEEDED.
7. BEGIN BUILDING CONSTRUCTION.
8. INSTALL PROPOSED UTILITIES.
9. INSTALL BASE COURSE OF PAVEMENT.
10. FINAL GRADE SLOPES AND TOPSOIL CRITICAL SLOPES; VEGETATE AND MULCH ALL DISTURBED AREAS.
11. ALL EROSION CONTROL PRACTICES WILL BE INSPECTED WEEKLY AND AFTER RAINFALL, NEEDED REPAIRS WILL BE PERFORMED IMMEDIATELY.
12. AFTER SITE IS STABILIZED, REMOVE ALL TEMPORARY MEASURES AND VEGETATE THE DISTURBED AREAS.
13. ESTIMATED CONSTRUCTION DATES: OCTOBER 2023 TO MAY 2024.




## WATTLE / SEDIMENT LOG

1 PER WDNR TECHNICAL STANDARD 1071

NOT TO SCALE

1. INSPECT SEDIMENT LOG WEEKLY AND WITHIN 24 HRS AFTER EVERY PRECIPITATION EVENT THAT PRODUCES 0.5 INCHES OF RAIN OR MORE WITHIN A 24 HOUR PERIOD.

2. SEDIMENT LOG SHALL BE PER THE WDOT EROSION CONTROL PRODUCT ACCEPTABILITY LIST (PAL).

3. SECURE PER MANUFACTURES SPECIFICATIONS.

**NOTE:**
**IF FEASILBE, SILT FENCE CAN BE INSTALLED INSTEAD OF THE WATTLES**

## LEGEND

| | |
|---|---|
| 190 | EXISTING CONTOUR |
| 190 | PROPOSED CONTOUR |
| x—189.5 | PROPOSED GRADE |
| ST | EXISTING STORM SEWER |
| ST | PROPOSED STORM SEWER |
| SAN | EXISTING SANITARY SEWER |
| SAN | PROPOSED SANITARY SEWER |
| W | EXISTING WATER MAIN |
| W | PROPOSED WATER MAIN |
| G | BURIED GAS MAIN |
| // | OVER HEAD WIRE |
| E | BURIED ELECTRIC |
| | SEDIMENT WATTLE |
| | LIMITS OF DISTURBANCE |

NOTES:

1. ALL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CHECKED FOR STABILITY AND OPERATION FOLLOWING EVERY ½" RUNOFF-PRODUCTION RAINFALL BUT IN NO CASE LESS THAN ONCE EVERY WEEK. ANY NEEDED REPAIRS WILL BE MADE IMMEDIATELY TO MAINTAIN ALL PRACTICES AS DESIGNED.

2. ALL SEEDED AREAS WILL BE WATERED, FERTILIZED, RESEEDED AS NECESSARY, AND MULCHED TO MAINTAIN A VIGOROUS, DENSE VEGETATIVE COVER.

3. ANY SEDIMENT REACHING A PUBLIC OR PRIVATE ROAD SHALL BE REMOVED BY STREET CLEANING BEFORE THE END OF EACH DAY.

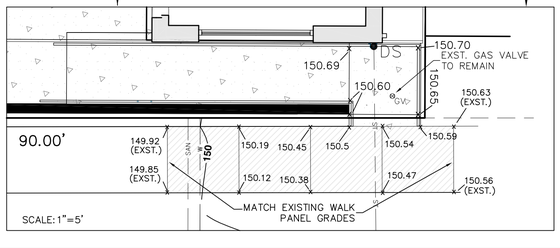
4. CONTRACTOR TO USE EXISTING REAR PARKING AND DRIVE APPROACH AS CONSTRUCTION ENTRANCE.

5. APPROXIMATE START DATE: NOVEMBER 2023
APPROXIMATE COMPLETION DATE: JUNE 2024

6. CONTRACTOR STAFF REQUIRED TO FOLLOW ALL PARKING REGULATIONS ON CITY OWNED STREETS

7. ALL CONSTRUCTION MATERIALS TO BE STORED ON SITE.

8. EXISTING ADA ACCESSIBLE RAMP ON THE NORTH SIDE OF THE BUILDING TO BE USED AS ADA ACCESSIBLE ACCESS ROUTE FOR EXISTING BUILDING




## TRUCKING ROUTE

EAST BOUND: TRUCKS TO ACCESS SITE VIA INTERSTATE 41 (ZOO INTERCHANGE/FREEWAY). USE EXIT 42A FOR SOUTHBOUND TRAFFIC – EXIT 42B FOR NORTH BOUND TRAFFIC. TRUCKS TO TRAVEL WEST BOUND ON W. NORTH AVENUE TO THE PROPOSED PROJECT SITE.

WEST BOUND: TRUCKS TO ACCESS SITE VIA STATE TRUNK HIGHWAY 175. TRUCKS TO CONTINUE ON NORTH 46TH ST. THEN TRAVEL NORTHWEST ON W LISBON AVENUE TO W. NORTH AVENUE. TURCKS TO HEAD EAST ON W. NORTH AVENUE TO PROPOSED PROJECT SITE.

## MAINTENANCE PLAN

1. ALL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CHECKED FOR STABILITY AND OPERATION FOLLOWING EVERY ½" RUNOFF-PRODUCTION RAINFALL BUT IN NO CASE LESS THAN ONCE EVERY WEEK. ANY NEEDED REPAIRS WILL BE MADE IMMEDIATELY TO MAINTAIN ALL PRACTICES AS DESIGNED.

2. SEDIMENT WILL BE REMOVED FROM BEHIND THE SILT FENCE WHEN IT BECOMES ABOUT 0.5 FT. DEEP AT THE FENCE. THE SILT FENCE WILL BE REPAIRED AS NECESSARY TO MAINTAIN A BARRIER.

3. ALL SEEDED AREAS WILL BE WATERED, FERTILIZED, RESEEDED AS NECESSARY, AND MULCHED TO MAINTAIN A VIGOROUS, DENSE VEGETATIVE COVER.

4. ANY SEDIMENT REACHING A PUBLIC OR PRIVATE ROAD SHALL BE REMOVED BY STREET CLEANING BEFORE THE END OF EACH DAY.

## THE CITY OF WAUWATOSA EROSION CONTROL NOTES:

1. Site Dewatering. Water pumped from the site shall be treated by sediment basins or other appropriate best management practices specified in the Wisconsin Construction Site Best Management Practices (BMP) Handbook. Water may not be discharged in a manner that causes erosion of the site, adjacent sites, or receiving channels.
2. Waste and Material Disposal. All waste and unused building materials (including garbage, debris, cleaning wastes, wastewater, toxic materials, or hazardous materials) shall be properly disposed and not allowed to be carried off-site by runoff or wind.
3. Tracking. Each site shall have graveled roads, access drives and parking areas of sufficient width and length to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by street cleaning, to the satisfaction of the city, before the end of each workday. Flushing may not be used unless sediment will be controlled by a sediment basin or other appropriate best management practice specified in the BMP Handbook.
4. Sediment Cleanup. All off-site sediment deposits occurring as a result of a storm event shall be cleaned up by the end of the next work day. All other off-site sediment deposits occurring as a result of construction activities shall be cleaned up by the end of the work day.
5. All activities on the site shall be conducted in a logical sequence to minimize the area of bare soil exposed at any one time.
6. All disturbed ground left inactive for seven or more days shall be stabilized by temporary or permanent seeding, temporary or permanent seeding and mulching, sodding, covering with tarps, or equivalent best management practices. If temporary seeding is used, a permanent cover shall also be required as part of the final site stabilization. Seeding or sodding shall be required as part of the final site stabilization.
7. Soil or dirt storage piles shall be located a minimum of twenty-five feet from any downslope road, lake, stream, wetland, or drainage channel. Straw bale or filter fabric fences shall be placed on the down slope side of the piles. If remaining for more than seven days, piles shall be stabilized by mulching, vegetative cover, tarps or other means.
8. When the disturbed area has been stabilized by permanent vegetation or other means, temporary best management practices such as filter fabric fences, straw bales, sediment and sediment traps shall be removed.
9. Notify the city engineering department (479-8934) within two working days of commencing any land development or land disturbing activity.
10. Notify the city of completion of any best management practices within the next working day after their installation.
11. Obtain permission in writing from the City of Wauwatosa engineering department prior to modifying the erosion control plan.
12. Repair any siltation or erosion damage to adjoining surfaces and drainage ways resulting from land development or land disturbing activities.
13. Inspect the best management practices after each rain of 0.5 inch or more and at least once each week and make needed repairs.
14. Keep a copy of the erosion control plan on the site.

## TEMPORARY STABILIZATION METHODS

TEMPORARY SEEDING:
DURING GROWING SEASON (MAY 2 – OCTOBER 31) TEMPORARY SEEDING (COVER CROP) TO BE USED FOR TEMPORARY STABILIZATION DURING SITE CONSTRUCTION.

| Species | Lbs/Acre | Percent Purity |
|---|---|---|
| Oats | 131 | 98 |
| Cereal Rye | 131* | 97 |
| Winter Wheat | 131* | 95 |
| Annual Ryegrass | 80* | 97 |

* Fall Seeding

LAND APPLICATION OF ADDITIVES:
DURING NONGROWING SEASON (NOVEMBER 1 – MAY 1) CONTRACTOR TO PROVIDE TYPE B SOIL STABILIZER DURING SITE CONSTRUCTION. STABILIZER TO BE POLYACRYLAMIDE (PAM) PER LATEST WDOT PAL (UPDATED 11/2/2017) – SEE WDNR TECHNICALSTANDARD 1050.

STABILIZATION SHOULD BE COMPLETED WITHIN 7 DAYS OF ESTABLISHING FINAL GRADE OR THAT WILL OTHERWISE EXIST FOR MORE THAN 14 DAYS.

## WINTER CONDITIONS

DURING WINTER CONSTRUCTION (NOVEMBER 1 TO MAY 1), CONTRACTOR TO PROVIDE TYPE B SOIL STABILIZER, POLYACRYLAMIDE (PAM) PER LATEST WDOT PAL (UPDATED 11/2/2017) ON ALL DISTURBED AREAS THAT ARE NOT TO BE DISTURBED BEYOND 7 DAYS. CONTRACTOR TO INSTALL PAM PER WDNR TECHNICAL STANDARD 1050 AND THE MANUFACTURERS SPECIFICATIONS.

PRESCRIPTIVE COMPLIANCE AREAS:
PER WDNR NR151.11 WIS. ADM. CODE
MAXIMUM PERIOD OF BARE SOIL EXPOSURE FOR SLOPES EXCEEDING 20%

| | MAXIMUM PERIOD OF BARE SOIL EXPOSURE (CALENDER DAYS) | |
|---|---|---|
| SLOPE AREA DRAINS TO SEDIMENT BASIN OR SEDIMENT TRAP | *LAND DISTURBANCE BETWEEN SEPT. 16TH AND MAY 1ST* | *LAND DISTURBANCE BETWEEN MAY 2ND AND SEPT. 15TH* |

**GRAPHIC SCALE**

10 0 5 10 20

**1 inch = 10 ft**

www.DiggersHotline.com
DIGGERS HOTLINE
DIAL 811 OR (800) 242-8511

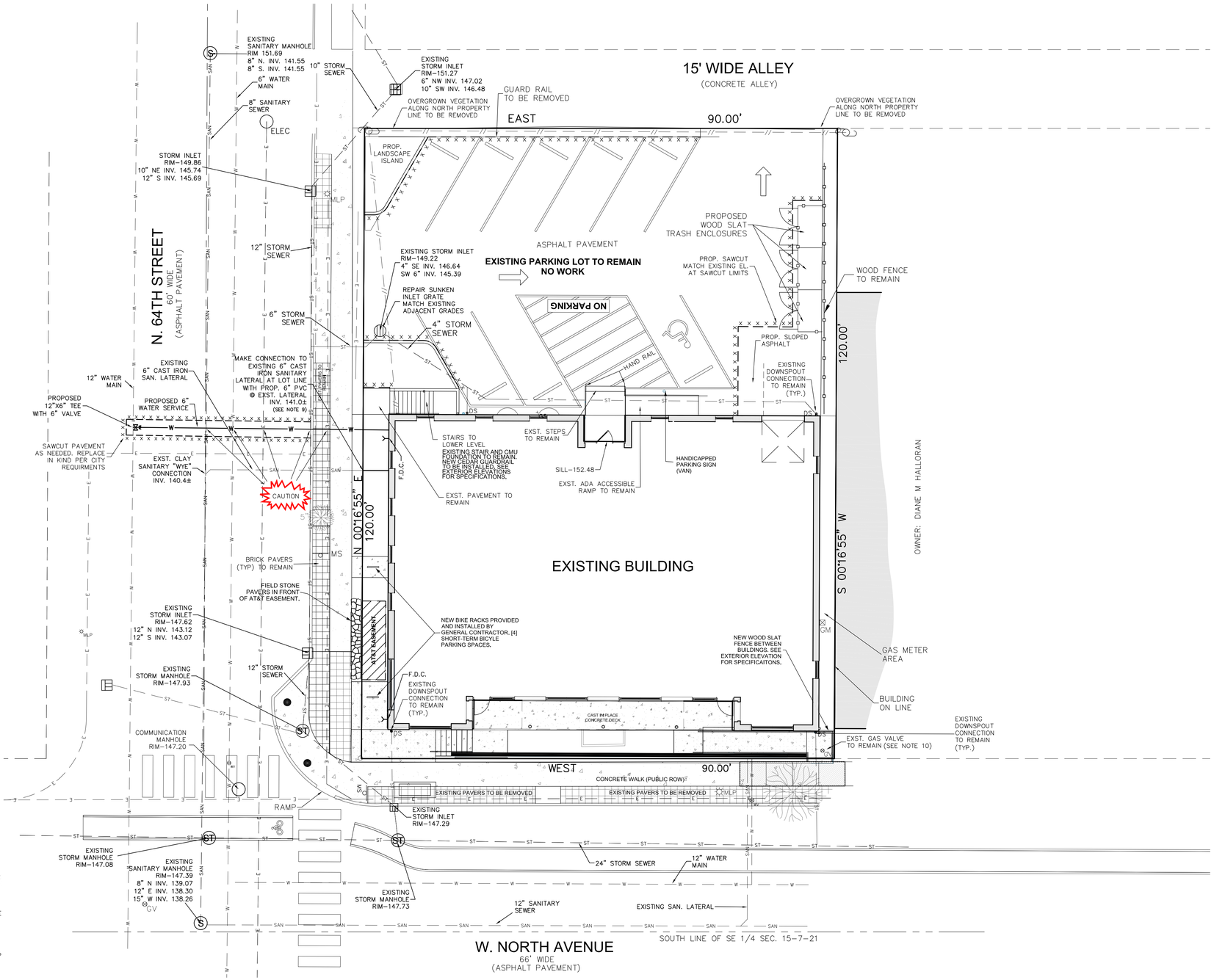
CJE NO.: 2342R4
AUGUST 24, 2023
REV.:09/07/23
REV.:11/01/23
REV.:12/05/23
REV.:01/02/24

*IDYLL COFFEE*
*TAX KEY: 3300171000*
*6330 W. NORTH AVENUE WAUWATOSA, WI*

# SITE GRADING & EROSION CONTROL PLAN

C2.0

CJ engineering
civil design and consulting
9205 W. Center Street
Suite 214
Milwaukee, WI 53222
PH. (414) 443-1312
FAX (414) 443-1317
www.cj-engineering.com




NOTES:

1. ALL STORM SEWER, SANITARY SEWER, AND WATER MAIN MATERIALS AND INSTALLATION PER APPLICABLE SECTIONS OF THE LATEST EDITIONS OF THE STANDARD SPECIFICATIONS FOR SEWER AND WATER CONSTRUCTION IN WISCONSIN (STANDARD SPECIFICATIONS), WISCONSIN ADMINISTRATIVE PLUMBING CODE AND THE CITY OF WAUWATOSA REQUIREMENTS.

2. ALL TRENCHES IN PAVEMENT AREAS SHALL HAVE GRAVEL BACKFILL.

3. EXACT SIZE AND LOCATION OF SANITARY AND WATER SERVICE TO PROPOSED BUILDING BY PLUMBING CONSULTANT/CONTRACTOR.

4. THE CONTRACTOR SHALL VERIFY SIZE, LOCATION, DEPTH AND CONDITION OF ALL SEWER AND WATER CONNECTIONS PRIOR TO UTILITY CONSTRUCTION. NOTIFY THE ENGINEER WITH ANY DISCREPANCIES.

5. STORM SEWER: PVC ASTM D3034, RCP ASTM C76, OR ADSN-12 HDPE
SANITARY SEWER: PVC ASTM D3034, SDR 35
*WATER MAIN: PVC, AWWA C900, CLASS 150 (DR18)

*MATERAL PER CITY REQUIREMENT. CONTRACTOR TO VERIFY.

6. ALL WATER SERVICE PIPING TO HAVE A MINIMUM OF 6 FEET OF COVER. MINIMUM VERTICAL SEPARATION FOR WATER SERVICE CROSSINGS SHALL BE 12" WHEN CROSSING ABOVE STORM AND SEWER LINES AND 24" WHEN CROSSING BELOW STORM AND SEWER LINES.

7. CONTRACTOR TO PROVIDE TRACER WIRE OR OTHER METHOD OF LOCATING FOR ALL UNDERGROUND EXTERIOR NON-METALLIC SANITARY, STORM AND WATER PIPE PER WISCONSIN PLUMBING CODE SECTION 182.0715(2r).

8. SANITARY BUILDING SEWERS 6" OR LESS IN DIAMETER SHALL BE PROVIDED WITH CLEANOUTS OR MANHOLES SUCH THAT A CLEANOUT IS LOCATED NOT MORE THAN 100 FEET APART.

9. CONTRACTOR TO REPAIR AND RELINE EXISTING SANITARY SEWER AS NEEDED PER CITY REQUIREMENTS.

10. CONTRACTOR TO ADJUST EXISTING GAS VALVE HEIGHT AS NEEDED FOR RAMP LANDING.

**LEGEND**

| | |
|---|---|
| —ST— | EXISTING STORM SEWER |
| —ST— | PROPOSED STORM SEWER |
| —SAN— | EXISTING SANITARY SEWER |
| —SAN— | PROPOSED SANITARY SEWER |
| —W— | EXISTING WATER MAIN |
| —W— | PROPOSED WATER MAIN |
| —G— | BURIED GAS MAIN |
| —//— | OVER HEAD WIRE |
| —E— | BURIED ELECTRIC |

www.DiggersHotline.com
DIGGERS HOTLINE
DIAL 811 OR (800) 242-8511

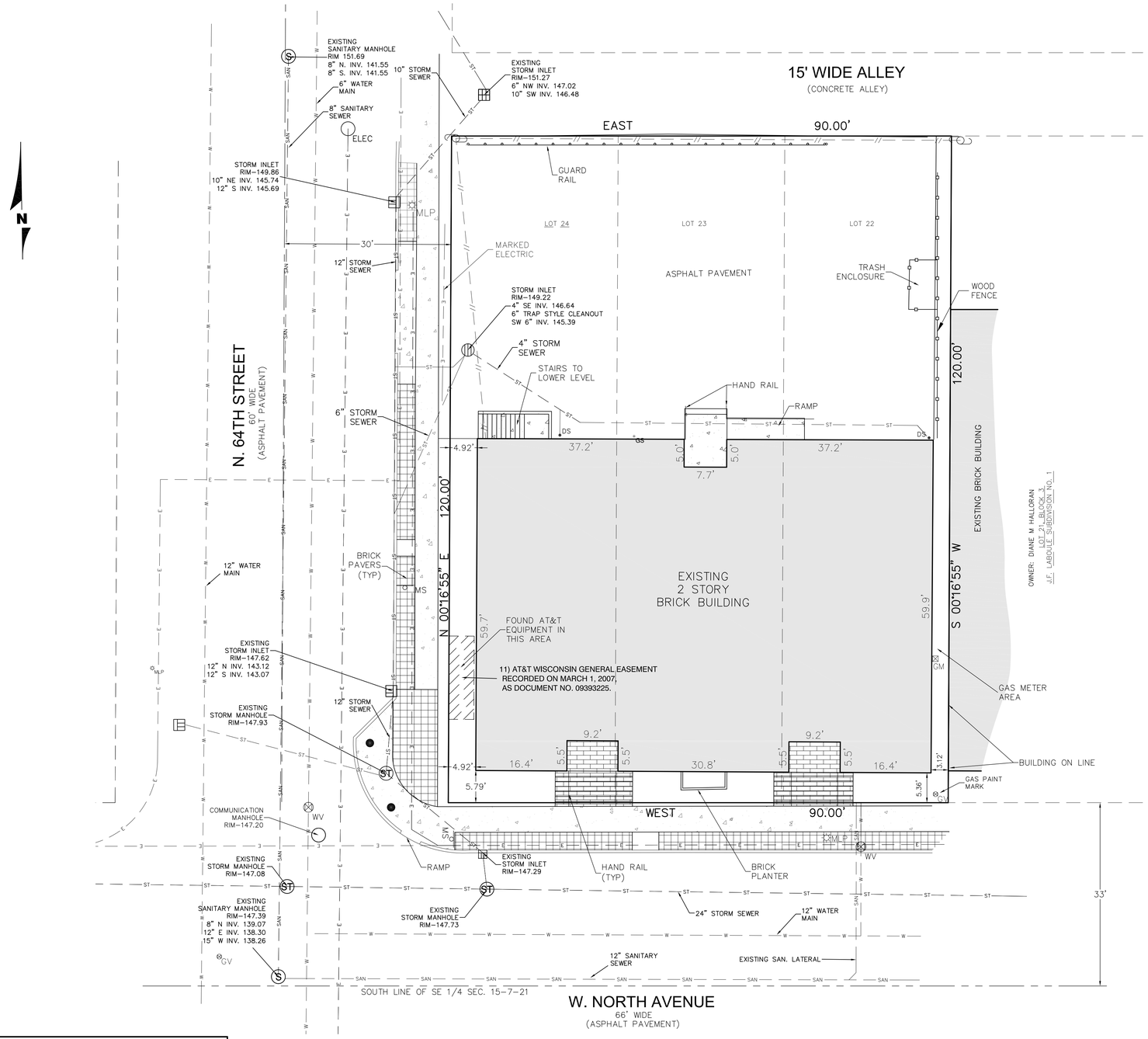
GRAPHIC SCALE
10 0 5 10 20
1 inch = 10 ft

# IDYLL COFFEE

TAX KEY: 3300171000
6330 W. NORTH AVENUE WAUWATOSA, WI

CJE NO.: 2342R4
AUGUST 24, 2023
REV.:09/07/23
REV.:11/01/23
REV.:12/05/23
REV.:01/02/24

## SITE UTILITY PLAN C3.0




## LEGAL DESCRIPTION

LOTS 22, 23, AND 24, IN BLOCK 3, IN J.F. LABOULE SUBDIVISION NO. 1, IN THE SOUTHEAST 1/4 OF SECTION 15, IN TOWNSHIP 7 NORTH, RANGE 21 EAST, IN THE CITY OF WAUWATOSA, COUNTY OF MILWAUKEE, STATE OF WISCONSIN.

CONTAINING: 10,800 S.F. (0.25 ACRES)

TAX KEY NO.: 330017100

## SURVEYOR'S NOTES

1) TITLE POLICY INFORMATION – PER CHICAGO TITLE INSURANCE COMPANY, FILE NO: CO-14054 COMMITMENT DATE OF MAY 18, 2023.

2) FLOOD PLAIN INFORMATION – PROPERTY IS IN ZONE X (AREA OF 0.2% ANNUAL CHANCE OF FLOOD) PER FIRM MAP NO. 55079C0086E, EFFECTIVE DATE OF SEPTEMBER 26, 2008

3) ZONING INFORMATION & BASIS – PER CITY OF WAUWATOSA ZONING DEPARTMENT – ZONED C1 DISTRICT/NORTH AVENUE OVERLAY (C1/NOR)

4) BUILDING SETBACKS, HEIGHT RESTRICTIONS & BASIS OF EACH – PER CITY OF WAUWATOSA ZONING DEPARTMENT

FRONT SET BACK – 0 FEET
SIDE STREET SET BACK – 0 FEET
INTERIOR SIDE SET BACK – 0 FEET
REAR – 0 FEET

5) LAND AREA – 10,800 SQUARE FEET

6) BUILDING AREA – 4,767 SQUARE FEET

7) BUILDING HEIGHT – 22' +/–

8) BASIS OF BEARINGS – NORTH LINE OF W. NORTH AVENUE – ASSUMED WEST

9) PARKING INFORMATION – PARKING STRIPING TO VAGUE TO LOCATE

10) UNDERGROUND SEWER AND UTILITY INFORMATION AS SHOWN IS OBTAINED FROM THE RECORDS OF MUNICIPALITY AND LOCAL UTILITY COMPANIES. THE ACCURACY OF WHICH CAN NOT BE GUARANTEED OR CERTIFIED TO.

11) THE LOCATIONS OF EXISTING UTILITY INSTALLATIONS AS SHOWN ON THIS SURVEY ARE APPROXIMATE. THERE MAY BE OTHER UNDERGROUND UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN.

12) WINDOW WELLS AROUND BUILDING NOT SHOWN.

13) THERE IS NO OBSERVED EVIDENCE OF CURRENT EARTH MOVING WORK, BUILDING CONSTRUCTION OR BUILDING ADDITIONS ON THE PROPERTY AT TIME OF SURVEY.

14) THERE IS NO OBSERVED EVIDENCE OF RECENT STREET OR SIDEWALK CONSTRUCTION OR REPAIRS OCCURRING ON OR ADJOINING THE PROPERTY AT TIME OF SURVEY.

15) THERE IS NO OBSERVED EVIDENCE OF USE OF THE PROPERTY AS A SOLID WASTE DUMP, SUMP OR SANITARY LANDFILL AT TIME OF SURVEY.

16) THERE IS NO OBSERVED EVIDENCE OF DELINEATED WETLANDS EXISTING ON SUBJECT PROPERTY AT TIME OF SURVEY.

17) THERE IS NO EVIDENCE OF CEMETERIES, GRAVE SITES, OR BURIAL GROUNDS EXISTING ON SUBJECT PROPERTY AS DISCLOSED IN THE RECORD DOCUMENTS OR OBSERVED IN THE PROCESS OF CONDUCTING THIS SURVEY.

## SCHEDULE B – EXCEPTIONS

11. AT&T WISCONSIN GENERAL EASEMENT RECORDED MARCH 1, 2007, AS DOCUMENT NO. 09393225 – AS SHOWN ON SURVEY

TO: DAPK, LLC; FIRST INTERNET BANK OF INDIANA, ITS SUCCESSORS AND/OR ASSIGNS; CHICAGO TITLE INSURANCE COMPANY :

THIS IS TO CERTIFY THAT THIS MAP OR PLAT AND THE SURVEY ON WHICH IT IS BASED WERE MADE IN ACCORDANCE WITH THE "MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/NSPS LAND TITLE SURVEYS," JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS IN 2021, AND INCLUDES ITEMS 1, 2, 3, 4, 6a, 6b, 7a, 7b1, 7c, 8, 9, 11, 13, 16, 17, AND 18 OF TABLE A THEREOF. PURSUANT TO THE ACCURACY STANDARDS AS ADOPTED BY ALTA AND NSPS AND IN EFFECT ON THE DATE OF THIS CERTIFICATION, UNDERSIGNED FURTHER CERTIFIES THAT IN MY PROFESSIONAL OPINION, AS A LAND SURVEYOR REGISTERED IN THE STATE OF WISCONSIN, THE RELATIVE POSITIONAL ACCURACY OF THIS SURVEY DOES NOT EXCEED THAT WHICH IS SPECIFIED THEREIN.

OCTOBER 27, 2023
DATE

CHRISTOPHER A. JACKSON, P.L.S.
PROFESSIONAL LAND SURVEYOR S-2851

WISCONSIN CHRISTOPHER A. JACKSON S-2851 WAUWATOSA, WI LAND SURVEYOR

CJ engineering
civil design and consulting
9205 W. Center Street
Suite 214
Milwaukee, WI 53222
PH. (414) 443-1312
www.cj-engineering.com

# DAPK, LLC

6330 W. NORTH AVENUE WAUWATOSA, WI

CJE NO.: 2342R0-ALTA
OCTOBER 27, 2023

## LEGEND

BASKETBALL HOOP (BH)
BENCHMARK (BM)
BOLLARD (BO)
BUSH, SHRUB, ETC.
CATCH BASIN ROUND (CB)
CATCH BASIN SQUARE (CB)
CLEAN OUT (CO)
CURB INLET (CB)
EVERGREEN TREE (EG)
FIRE HYDRANT (HYD)
FLAG POLE (FP)
GUY WIRE (GW)
HANDICAP
IRON PIPE (I.P.)
LIGHT POLE
MAIL BOX (MB)
MANHOLE (MH)
MONITORING WELL (MW)
SIGN (TRAFFIC, ETC.)
SOIL BORING (SB)
TRAFFIC LIGHT (TL)
DECIDUOUS TREE (TR)
UTILITY MARKER
UTILITY METER
UTILITY PEDESTAL
UTILITY POLE (UP)
UTILITY VALVE
WATER WELL

ABBREVIATIONS

| | |
|---|---|
| F/L | FLOW LINE |
| I.E. | INVERT ELEVATION |
| FND | FOUND |
| MLP | METAL LIGHT POLE |
| CLP | CONCRETE LIGHT POLE |
| WLP | WOOD LIGHT POLE |
| FGLP | FIBERGLASS LIGHT POLE |
| MS | METAL SIGN |
| GM | GAS METER |
| EM | ELECTRIC METER |
| D.S.E. | DOOR SILL ELEVATION |
| EP | ELECTRIC PEDESTAL |
| F.F.E. | FIRST FLOOR ELEVATION |
| FO | FIBER OPTIC CABLE |
| GV | GAS VALVE |
| WV | WATER VALVE |
| CTP | CABLE TV PEDESTAL |
| WLF | WETLAND FLAG |
| YL | YARD LIGHT |

LINE TYPES

SANITARY FORCE MAIN

LINE TYPES (CONT.)

METAL FENCE
WOOD FENCE
GUARD RAIL
BURIED CABLE TV
BURIED COMMUNICATIONS
COMBINATION SEWER
BURIED ELECTRIC
BURIED FIBER OPTIC
BURIED GAS SERVICE
OVERHEAD UTILITY LINES
SANITARY SEWER
STORM SEWER
BURIED TELEPHONE
WATER MAIN / SERVICE

www.DiggersHotline.com
DIGGERS HOTLINE
DIAL 811 OR (800) 242-8511

GRAPHIC SCALE
10 0 5 10 20
1 inch = 10 ft

# ALTA/NSPS LAND TITLE SURVEY

SV1.0

**File #:** 24-0010 **Agenda Date:** 1/16/2024 **Agenda #:** 2.

Request by Nick Carnahan of Galbraith Carnahan Architects on behalf of DAPK LLC for an encroachment at 6330 W. North Avenue

**Submitted by:**
Jennifer Stilling
**Department**
Public Works (Engineering Division)

## A. Issue

The applicant is requesting an encroachment for flagstone paving and landscaping to be installed at the back of the existing sidewalk within the N. 64th Street right-of-way on the east side of the street adjacent to the proposed redevelopment project at 6330 W. North Avenue.

## B. Background/Options

The justification for the encroachment is explained in the attached memorandum provided by the applicant. The encroachment areas are highlighted on the attached. Staff has reviewed the plans that depict the encroachments and does not have any objections. Edging will be required for all landscaped areas adjacent to the public walk.

## C. Strategic Plan (Area of Focus)

Economic Development and Financial Resilience

## D. Fiscal Impact

No impact to the City of Wauwatosa.

## E. Recommendation

Staff recommends that the Board of Public Works allow the landscaping and paving encroachment at 6330 W. North Avenue with the execution of a hold harmless agreement.

***Recommendation:*** Common Council

# Board of Public Works Application

City of Wauwatosa
7725 West North Avenue
Wauwatosa, WI 53213
414-479-8907
www.wauwatosa.net

***Property Information***

Project Address: 6330 W. North Avenue, Wauwatosa WI 53213

***Applicant or Agent Information***

Name Nick Carnahan

Company Galbraith Carnahan Architec

Address 6404 W. North Ave.

City Wauwatosa State WI Zip 53213

Phone 414-291-0772

Email nac@galbraithcarnahan.com

***Property Owner Information***

Name Dave Tamburrino

Company DAPK LLC

Address 2463 N. 67th Street

City Wauwatosa State WI Zip 53213

Phone 414-731-4525

Email davetambo@yahoo.com

## APPLICATION TYPE

All fees are $100 unless noted.

- ✔ Encroachment
- ☐ Air Condenser Location
- ☐ Well abandonment
- ☐ City Co-Location
- ☐ Swimming Pool Location
- ☐ Property Maintenance Appeal
- ☐ Landscape Appeal
- ☐ Neighborhood Association Signs
- ☐ Extension of Work Hours
- ☐ Other
- ☐ Site Plan Appeal
- ☐ Commercial Fence Appeal
- ☐ ROW Construction Staging
- ☐ Parking Exception **$150**

*Make checks payable to: City of Wauwatosa*

***This application must be completed and filed with the Development Office and is required for Board of Public Works review.***

***Proposed Request-*** Specify reason for petition and what particular hardships are involved. Examples: insufficient lot area, insufficient front, side or rear setback, placement of equipment would decrease efficiency, etc.

See attached memorandum.

Applicant or Agent Signature: _____ Date: 12-14-23

**FOR CITY USE ONLY:**

Accepted by _____

Date _____

Zoning District _____

Aldermanic District _____

MT# _____

Fee

Amount Paid _____

Receipt # _____

Date paid _____

Updated December 2021

Meeting Dates

BPW _____

Council _____

Other _____

(over)

## ***BOARD OF PUBLIC WORKS APPLICATION DEADLINES***

| **APPLICATION DEADLINE** | **BOARD OF PUBLIC WORKS @ 8:30 AM** |
|---|---|
| January 5, 2023…… | January 17, 2023 (Tuesday) |
| January 26, 2023…… | February 6, 2023 |
| February 9, 2023 …… | February 20, 2023 |
| February 23, 2023…… | March 6, 2023 |
| March 9, 2023 …… | March 20, 2023 |
| March 23, 2023 …… | April 3, 2023 |
| April 6, 2023 …… | April 17, 2023 |
| April 20, 2023 …… | May 1, 2023 |
| May 4, 2023 …… | May 15, 2023 |
| May 25, 2023 …… | June 5, 2023 |
| June 8, 2023 …… | June 20, 2023 (Tuesday) |
| June 22, 2023 …… | July 3, 2023 |
| July 6, 2023 …… | July 17, 2023 |
| July 20, 2023 …… | July 31, 2023 |
| August 24,2023 …… | September 5, 2023 (Tuesday) |
| September 7, 2023 …… | September 18, 2023 |
| September 21, 2023 …… | October 2, 2023 |
| October 5, 2023 …… | October 16, 2023 |
| October 26, 2023 …… | November 6, 2023 |
| November 9, 2023 …… | November 20, 2023 |
| November 22, 2023…… | December 4, 2023 |
| December 7, 2023 …… | December 18, 2023 |
| December 21, 2023…… | January 2, 2024 (Tuesday) |
| January 4, 2023…… | January 16, 2024 (Tuesday) |

*See handout for complete approval process



(over)

GALBRAITH CARNAHAN ARCHITECTS

**RE: ENCROACHMENT AGREEMENT**

January 4th 2024

Idyll Coffee Roasters
6330 W. North Avenue
Wauwatosa WI 53213

## ENCROACHMENT SOUGHT

We are seeking an encroachment into the city's Right Of Way (R.O.W.) along the West perimeter of our project. The encroachment is being sought in order to extend landscaping and paving to the edge of the sidewalk along 64th Street.

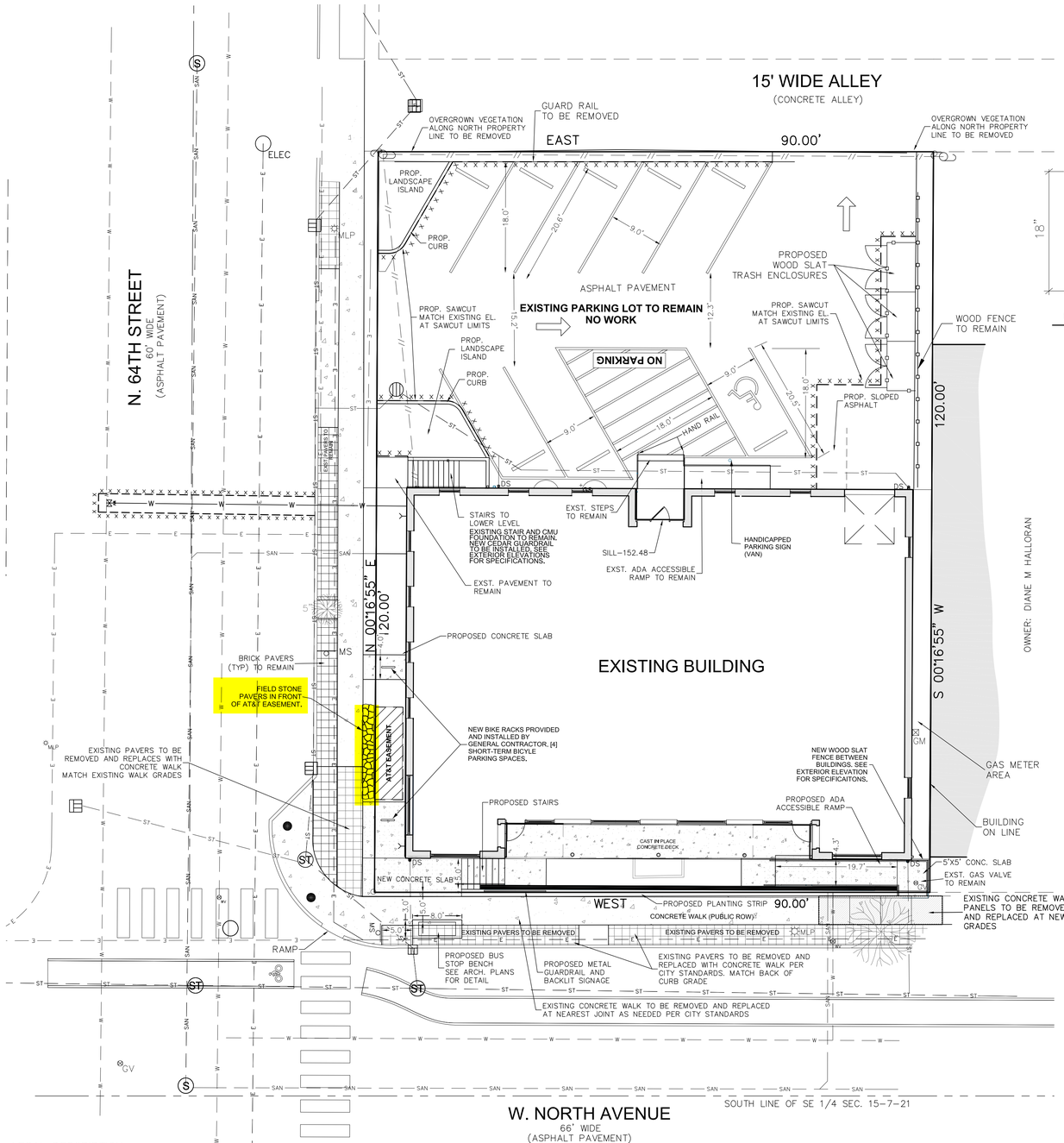
Hardscape elements will be limited to concrete paving used to access bike parking on the site as well as an area of flagstone paving in front of an AT&T easement located along the Western edge of the site. This easement is used frequently by AT&T personal to access equipment located there. The flagstone will provide an attractive looking working surface in front of that equipment.

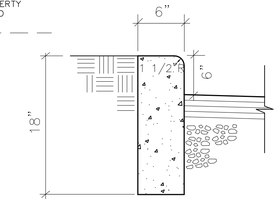
Further north along the 64th street property line, we would like to encroach up to the sidewalk for some of our landscaping elements. This will help provide a more seamless look to the landscaping and eliminate a narrow band of grass that would be difficult to maintain with the de minimis size and salt from the sidewalk.

Enclosed with our application is a current landscape and civil plan for the project.



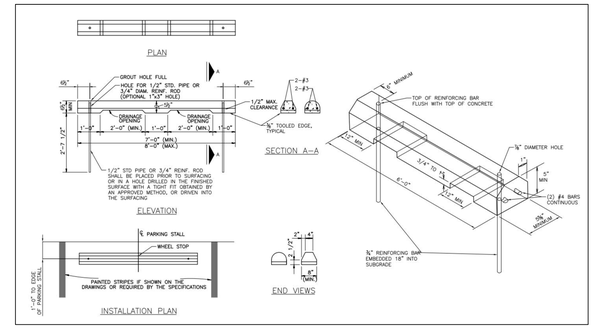
6404 West North Avenue, Wauwatosa, Wisconsin 53213 ▪ PHONE: (414) 291-0772 ▪ WEB: www.galbraithcarnahan.com



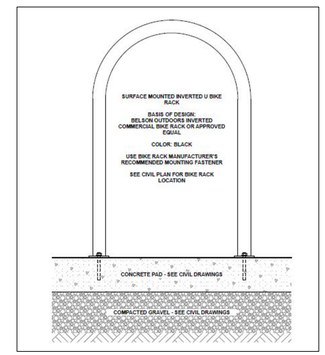

CONCRETE CURB DETAIL

NOT TO SCALE



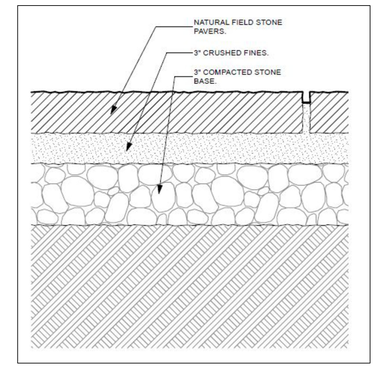

CONCRETE WHEEL STOP DETAIL

NOT TO SCALE



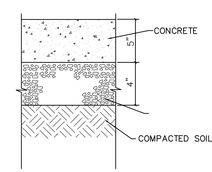

BIKE RACK

NOT TO SCALE



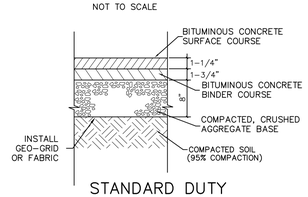

FIELD STONE PAVERS

NOT TO SCALE



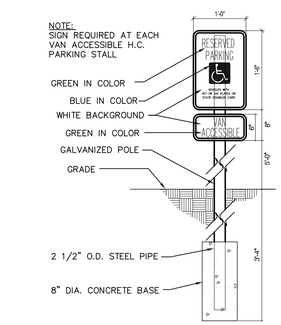

CONCRETE SIDEWALK

NOT TO SCALE




STANDARD DUTY ASPHALT PAVEMENT (PARKING AREA)

NOT TO SCALE




HANDICAPPED PARKING SIGN DETAIL (VAN ACCESSIBLE)

NOT TO SCALE

CJ engineering
civil design and consulting
9205 W. Center Street
Suite 214
Milwaukee, WI 53222
PH. (414) 443-1312
FAX (414) 443-1317
www.cj-engineering.com

N

# IDYLL COFFEE

TAX KEY: 3300171000

6330 W. NORTH AVENUE WAUWATOSA, WI

CJE NO.: 2342R4
AUGUST 24, 2023
REV.:09/07/23
REV.:11/01/23
REV.:12/05/23
REV.:01/02/24

## LEGAL DESCRIPTION

LOTS 22, 23, AND 24, IN BLOCK 3, IN J.F. LABOULE SUBDIVISION NO. 1, IN THE SOUTHEAST 1/4 OF SECTION 15, IN TOWNSHIP 7 NORTH, RANGE 21 EAST, IN THE CITY OF WAUWATOSA, COUNTY OF MILWAUKEE, STATE OF WISCONSIN.

CONTAINING: 10,800 S.F. (0.25 ACRES)

## NOTES:

1. DISTURBED AREA = 2,022 S.F. (0.046 ACRES)
2. THERE IS AN INCREASE OF 78 S.F. OF IMPERVIOUS SURFACE ON THE SITE.
3. TAX ID NUMBERS: 3300171000
4. ALL WORK IN THE RIGHT OF WAY SHALL BE DONE IN ACCORDING TO THE CITY REQUIREMENTS AND SPECIFICATIONS AND REQUIRES A STREET OCCUPANCY PERMIT FROM THE CITY.
5. PAVEMENT MARKINGS SHALL BE 3" WIDE STRIPED IN WHITE OR YELLOW TRAFFIC PAINT.
6. PROPOSED DEVELOPMENT WILL NOT DISTURB MORE THAN 1 ACRE AND WILL INCREASE THE AMOUNT OF IMPERVIOUS SURFACE BY 78 S.F. THEREFORE A STORM WATER MANAGEMENT PLAN IS NOT REQUIRED.

SITE AREAS: EXISTING

PROPERTY AREA = 10,800 S.F. (0.248 ACRES)

EXISTING BUILDING = 4,767 S.F. (0.109 ACRES)
EXISTING PAVEMENT = 5,166 S.F. (0.119 ACRES)

EXISTING IMPERVIOUS = 9,933 S.F. (0.228 ACRES)
EXISTING OPEN = 867 S.F. (0.020 ACRES)

EXISTING DESIGNATED ON SITE SURFACE PARKING (TO BE RESTRIPED)
8 REGULAR STALLS
1 ADA ACCESSIBLE STALL
9 TOTAL PARKING STALLS

0 BIKE PARKING STALLS

SITE AREAS: PROPOSED

PROPOSED BUILDING FOOTPRINT = 4,271 S.F. (0.098 ACRES)
PROPOSED PAVEMENT = 5,740 S.F. (0.138 ACRES)

PROPOSED IMPERVIOUS = 10,011 S.F. (0.236 ACRES)
PROPOSED OPEN = 789 S.F. (0.012 ACRES)

PROPOSED ON SITE SURFACE PARKING:
7 REGULAR STALLS
1 ACCESSIBLE STALL
8 TOTAL STALLS

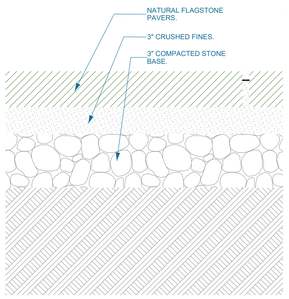
4 SHORT TERM BIKE PARKING STALLS
2 LONG TERM BIKE PARKING STALLS (SEE ARCHITECTURAL PLANS FOR INTERIOR LOCATION)

GRAPHIC SCALE

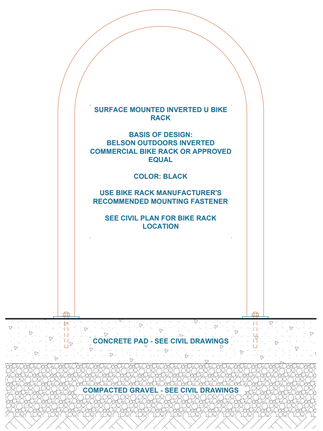
10 0 5 10 20

1 inch = 10 ft

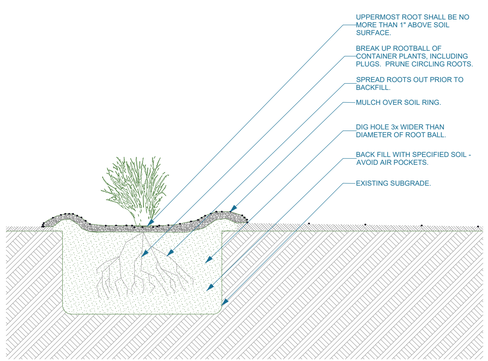
# SITE PLAN C1.0



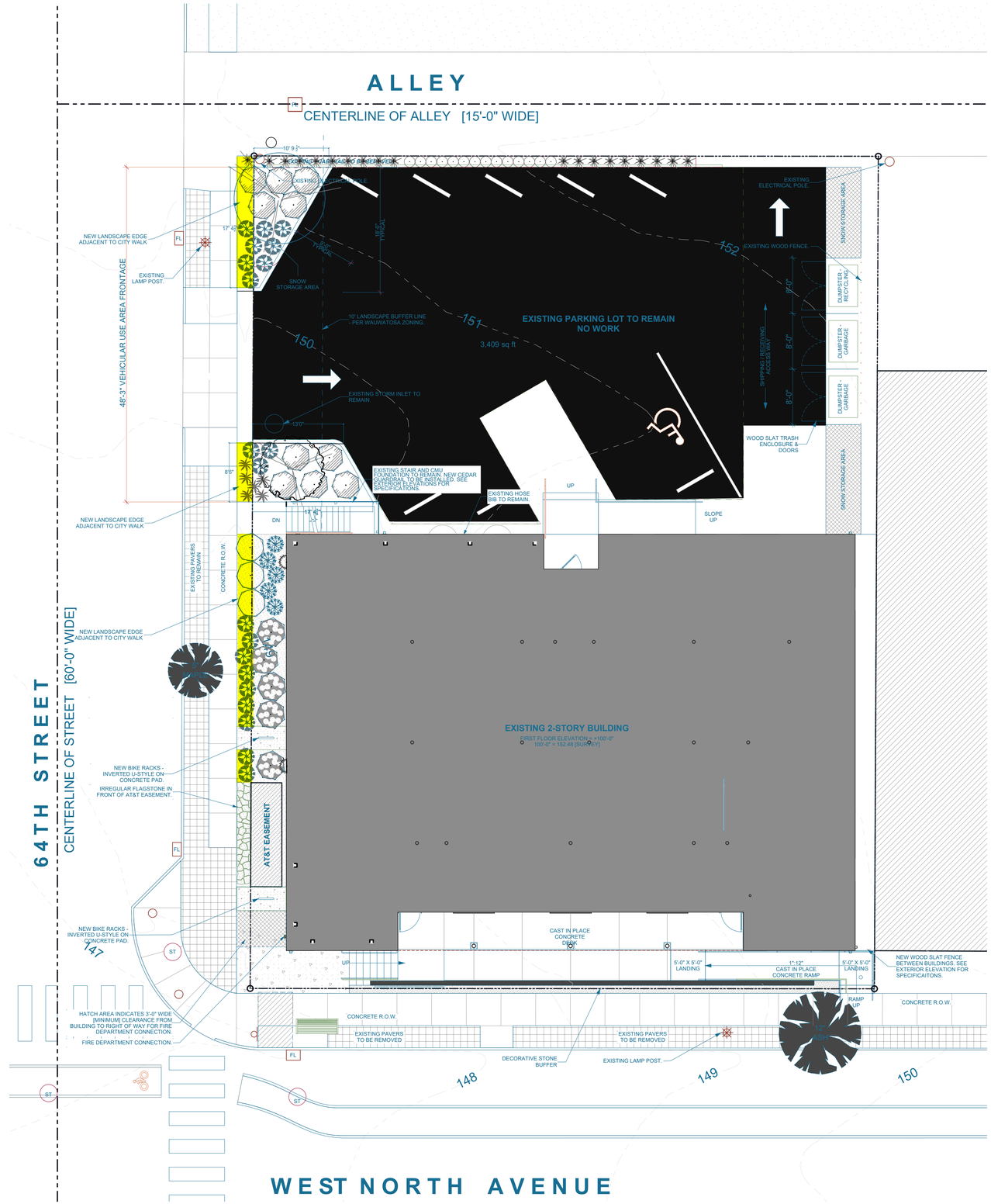

2 A001 FIELD STONE PAVERS
SCALE: 3" = 1'-0"




3 A001 BIKE RACK
SCALE: 1 1/2"= 1'-0"




4 A001 PLANTING DETAIL
NOT TO SCALE




1 A001 ARCHITECTURAL LANDSCAPE PLAN
SCALE: 1/8" = 1'-0"

## SITE DATA TABLE

**TAX KEY:** 330-0171-000

**ZONING =** C1 / NOR

**PERIMETER VEHICLE USE AREA (LENGTH)=** 48'-2 1/2" L.F.

PERIMETER VEHICLE USE AREA (AREA) = 4,152 S.F.

**NEW TREES - PARKING AREA =** 0

**NEW BUSHES - PARKING AREA =** 0

## PLANTINGS LEGEND

**SCIENTIFIC NAME:** OSTRYA VIRGINI/
**COMMON NAME:** IRONWOOD
**ROOT TYPE:** 2.5" CALIPER, B&B
**ESTABLISHED HEIGHT:** 15' TO 20'

**SCIENTIFIC NAME:** MALUS SARGENT
**COMMON NAME:** TINA SARGENT CRa
**ROOT TYPE:** 2" CALIPER, B&B
**ESTABLISHED HEIGHT:** 8' TO 10'

**SCIENTIFIC NAME:** RHUS AROMATICA 'GRO-LOW'
**COMMON NAME:** GRO-LOW SUMAC
**ROOT TYPE:** #3 CONTAINER
**ESTABLISHED HEIGHT:** 1.5' TO 2'

**SCIENTIFIC NAME:** DIEVILLA LONICERA
**COMMON NAME:** DWARF BUSH HONEYSUCKLE
**ROOT TYPE:** #3 CONTAINER
**ESTABLISHED HEIGHT:** 3' TO 4'

**SCIENTIFIC NAME:** HYDRANGEA PANICULATA 'LITTLE QUICKFIRE'
**COMMON NAME:** LITTLE QUICKFIRE HYDRANGEA
**ROOT TYPE:** #3 CONTAINER
**ESTABLISHED HEIGHT:** 4' TO 5'

**SCIENTIFIC NAME:** PANICUM VIRGATUM 'NORTHWIND'
**COMMON NAME:** NORTHWIND SWITCH GRASS
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 3'

**SCIENTIFIC NAME:** SPOROBOLUS HETEROLEPIS 'TARA'
**COMMON NAME:** TARA PRAIRIE DROPSEED
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 1'

**SCIENTIFIC NAME:** SCHIZACHYRIUM SCOPARIUM 'STANDING OVATI
**COMMON NAME:** STANDING OVATION LITTLE BLUESTEM
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 1'-6"

**SCIENTIFIC NAME:** RUSSIAN SAGE 'LITTLE SPIRE'
**COMMON NAME:** LITTLE SPIRE RUSSIAN SAGE
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 1'-6"

**SCIENTIFIC NAME:** ALLIUM 'SUMMER BEAUTY'
**COMMON NAME:** ORNAMENTAL ONION
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 1'-6"

**SCIENTIFIC NAME:** CLEMATIS TERNIFLORA 'SWEET AUTUMN'
**COMMON NAME: SWEET AUTUMN CLEMATIS**
ROOT TYPE: 1 GALLON POT
ESTABLISHED HEIGHT: 6-7'

## SITE DATA TABLE

| | |
|---|---|
| VEHICULAR USE AREA: | 3,409 SF. |
| PERIMETER LANDSCAPED AREA: | 345 S.F. / 11.3% |
| VEHICULAR USE AREA FRONTAGE: | 48'-3" |
| REQUIRED PERIMETER LANDSCAPING | |
| DECIDUOUS TREES: | 2 TOTAL |
| SHRUBS: | 8 TOTAL |
| INTERIOR LANDSCAPED AREA: | 0 S.F. / 0% |

## SOIL COMPACTION – GENERAL REQ.

THE FOLLOWING PARAMETERS SHALL DEFINE THE GENERAL DESCRIPTION OF THE THRESHOLD POINTS OF SOIL COMPACTION IN EXISTING, MODIFIED, OR INSTALLED SOIL AND SUBSOIL.

1. ACCEPTABLE COMPACTION: GOOD ROOTING ANTICIPATED, BUT INCREASING SETTLEMENT EXPECTED AS COMPACTION IS REDUCED AND/OR IN SOIL WITH A HIGH ORGANIC MATTER CONTENT.
   A. BULK DENSITY METHOD - VARIES BY SOIL TYPE.
   B. STANDARD PROCTOR METHOD - 75-85%; SOIL BELLOW 75% IS UNSTABLE AND WILL SETTLE EXCESSIVELY.
   C. PENETRATION RESISTANCE METHOD - ABOUT 75-250 PSI, BELOW 75 PSI SOIL BECOMES INCREASINGLY UNSTABLE AND WILL SETTLE EXCESSIVELY.

2. ROOT LIMITING COMPACTION: ROOT GROWTH IS LIMITED WITH FEWER, SHORTER AND SLOWER GROWING ROOTS.
   A. BULK DENSITY METHOD - VARIES BY SOIL TYPE
   B. STANDARD PROCTOR METHOD - ABOVE APPROXIMATELY 85%
   C. PENETRATION RESISTANCE METHOD - ABOUT 300 PSI.

3. EXCESSIVE COMPACTION: ROOTS NOT LIKELY TO GROW BUT CAN PENETRATE SOIL WHEN SOIL IS ABOVE FIELD CAPACITY.
   A. BULK DENSITY METHOD - VARIES BY SOIL TYPE.
   B. STANDAR PROCTOR METHOD - ABOVE 90%.
   C. PENETRATION RESISTANCE METHOD - APPROXIMATELY ABOVE 400 PSI.

## PLANTING MEDIA – GENERAL REQ.

SOIL USED ON THE PROJECT MUST ADHERE TO THE FOLLOWING REQUIREMENTS:

1. THE SOIL MIX MIX MUST BE UNIFORM AND FREE OF STONES, STUMPS ROOTS OR OTHER SIMILAR MATERIAL GREATER THAN 2 INCHES IN DIAMETER.

2. THE PH SHOULD BE BETWEEN 4.5 AND 7.0. IF THE PH FALLS OUTSIDE OF THIS RANGE, IT MAY BE MODIFIED WITH LIME TO INCREASE THE PH OR IRON SULFATE AND SULFER TO LOWER THE PH. THE LIME OR IRON SULFATE MUST BE MIXEDD UNIFORMLY INTO THE SOIL PRIOR TO USE.

3. TOPSOIL STOCKPILE LOCATION (IF USING ON-SITE SOILS) OR SOURCE OF TOPSOIL IF IMPORTED TO THE SITE. SOIL ANALYSIS FOR ALL TOPSOIL TO BE UTILIZED PRIOR TO PLACEMENT.

## LANDSCAPE PLAN - GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR CONTACTING PUBLIC AND PRIVATE UNDERGROUND UTILITY LOCATION SERVICE TO HAVE SITE MARKED PRIOR TO ANY DIGGING OR EARTHWORK.

2. ANY AREAS DISTURBED BY CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION.

3. TOPSOIL SHOULD BE PLACED TO WITHIN 3" OF FINISH GRADE BY THE GENERAL / GRADING CONTRACTOR DURING ROUGH GRADING OPERATIONS. THE LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FINE GRADING OF ALL LANDSCAPED AREAS. A MINIMUM DEPTH OF 3" OF BLENDED, PREPARED, AND NON-COMPACTED TOPSOIL IS REQUIRED FOR ALL SEEDED AREAS. FINISH LANDSCAPED AREAS TO BE SMOOTH, UNIFORM, AND PROVIDE POSITIVE DRAINAGE AWAY FROM ALL STRUCTURES AND PAVEMENT.

GCA_logo+type_small 7807768S.jpg

6404 West North Avenue
Milwaukee, Wisconsin 53213
(414) 291-0772 phone
www.galbraithcarnahan.com

CONSULTANTS:

LANDWORKS landscape services
LandWorks Inc.
N69W25195 Indian Gass Ln.
Sussex, WI 53089
(262)-820-2501

Drawn by: Evan Kasper
Checked by: Samantha Carlson,PLA

# IDYLL COFFEE

6330 W. NORTH AVENUE
WAUWATOSA, WI 53213
TAX KEY: 330-0171-000

| DRAWING ISSUE | DATE |
|---|---|
| EXISTING BASE PLANS | 10.20.22 |
| PRE-APPLICATION DRAWINGS | 05.17.23 |
| CONDITIONAL USE / SITE PLAN APPLICATION | 06.06.23 |
| 50% CD'S | 08.24.23 |

PROJECT # 22.38

ARCHITECTURAL LANDSCAPE PLAN

A001

NOT FOR CONSTRUCTION

© 2023 GALBRAITH CARNAHAN ARCHITECTS LLC

7725 W. North Avenue
Wauwatosa, WI 53213

**File #:** 23-1375 **Agenda Date:** 1/16/2024 **Agenda #:** 3.

Request for the acceptance of a Non-Motorized Multi-Use Pedestrian Trail Easement Agreement at 3029 N. 112th Street

**Submitted by:**
Jennifer Stilling
**Department:**
Public Works (Engineering Services Division)

## A. Issue

The Engineering Services Division is requesting acceptance of a Non-Motorized Multi-Use Pedestrian Trail Easement Agreement at 3029 N. 112th Street.

## B. Background/Options

The property at 3029 N. 112th Street is proposed for redevelopment into a car wash. As part of the site plan approval process, staff required that space for a multi-use trail must be accommodated into the proposed site plan. As properties redevelop along the west side of N. 112th Street, space must be reserved for a five feet wide terrace, ten feet wide multi-use trail and two feet wide clear space behind the existing N. 112th Street curb for future City multi-use trail construction. This future multi-use trail is intended to connect Mayfair Collection to the public schools to the south. To accommodate this full cross section, a nine-foot-wide easement parallel to the existing public right-of-way is proposed. The approved site plans for this redevelopment show the area that is reserved for multi-use trail, the proposed acceptable cross slope within the easement, and no permanent obstructions.

The proposed agreement is attached. The City will be responsible for construction of the trail when funds are available. After the trail is constructed, snow removal shall be the responsibility of the property owner in accordance with City Code 24.12.010. The property owner's financial obligations towards the repair or maintenance of the trail after construction will be in accordance with the City's assessment resolution at the time of such repair or maintenance is required.

## C. Strategic Plan (Area of Focus)

Priority Area Three (Infrastructure): Ensure the City's infrastructure supports public health through multi-modal transportation and recreational opportunities.

**D. Fiscal Impact**

No impact to the City.

**E. Recommendation**

Staff recommends acceptance of the multi-use trail easement.

***Recommendation:*** Common Council

**Non-Motorized Multi-Use Pedestrian Trail**
**Easement Agreement**

THIS AGREEMENT, made this ____ day of _____, 2024, by and between GRANTOR, a Wisconsin Limited Liability Company ("Grantor") and CITY OF WAUWATOSA, a Wisconsin Municipal Corporation ("Grantee").

1. PURPOSE: Grantor is redeveloping an old industrial property into a car wash facility. Grantor and Grantee seek to enhance bicycle and pedestrian traffic in and around this new development and to help achieve this goal, Grantor will grant Grantee an Easement with a five (5) foot wide terrace, ten (10) foot wide multi-use trail and two (2) foot wide clear space behind the existing curb for future City multi-use trail construction along the eastern edge of Grantor's Property as more particularly described pursuant to a metes and bounds description in Section 5, below (the "Trail Easement"). The purpose of the Trail Easement is to allow the construction of a public non-motorized bicycle and pedestrian recreation trail to connect to and be a part of Grantee's overall "Safe Routes to School" non-motorized route ("Safe Routes to School Trail") designed to circumvent high-traffic areas and utilize grade-separated pathways, bridges or tunnels to the greatest extent possible, with dedicated signage and passage through well-lit residential and mixed use areas to the north and south of Burleigh Street while avoiding direct interaction with challenging rail and highway barriers.

2. EASEMENT: Grantor grants, and Grantee accepts, the Trail Easement over, under, and through Grantor's Property (defined below) described in this Non-Motorized Multi-Use Pedestrian Trail Easement Agreement. Grantee is allowed to use the Trail Easement as part of its public Safe Routes to School Trail system as more specifically described in this Easement Agreement and as may be further described in Grantee's Ordinances, Resolutions, and policies related to bicycles and pedestrians. This Trail Easement will allow the construction of a public non-motorized bicycle and pedestrian recreation trail to connect to and be a part of Grantee's overall "Safe Routes to School" non-motorized route ("Safe Routes to School Trail") and the nearby public sidewalk system. In addition to the installation of the actual trail, Grantee may install signage to the extent it is necessary or desirable as part of its public trail. This Easement is subject to the rights and obligations as described in this Easement Agreement.

3. CONSIDERATION: The sum of One and NO/100 dollars ($1.00) along with other good and valuable consideration, the receipt and sufficiency of which is acknowledged. Both parties agree that each is giving and receiving material benefits exceeding monetary value. Both Grantor and Grantee benefit from increased ability of bicycles and pedestrians to utilize the public trails and sidewalks, regardless of whether bicyclists and pedestrians are Grantor tenants or members of the public.

4. GRANTOR'S PROPERTY: Grantor's larger Property on which this Easement is located is described as follows ("Grantor's Property"):

That part of the Northeast 1/4 of Section 18, Town 7 North, Range 21 East, in the City of Wauwatosa, County of Milwaukee, State of Wisconsin, bounded and described as follows:

Commencing at a point in the North line of said 1/4 Section, 993.21 feet East of the Northwest corner of said 1/4 Section; running thence Southerly along the West line of the East 1/2 of the East 1/2 of the West 1/2 of said 1/4 Section, 389.82; feet to the place of beginning of the land about to be described; Continuing thence Southerly along the West line of the; East 1/2 of the East 1/2 of the West 1/2 of said Northeast 1/4 Section, 168.00 feet to a point; thence Easterly and parallel; to the North line of said 1/4 Section 331.01 feet to a point; thence Northerly along the West line of the East 1/2 of said ¼; Section, 168.00 feet to a point; thence Westerly and parallel to the North line of said 1/4 Section, 331.03 feet to the place; of beginning, Except the East 30 feet conveyed to the City of Wauwatosa by Deed recorded as Document No. 3870211.

Tax Key No.: 299-9971-00
Address: 3029 N. 112th Street

5. TRAIL EASEMENT: The Trail Easement subject to the terms of this Easement Agreement is located in the City of Wauwatosa, Milwaukee County, Wisconsin, and is described as follows:

9' WIDE PUBLIC TRAIL EASEMENT MEETS AND BOUNDS:
That part of the Northeast 1/4 of Section 18, Town 7 North, Range 21 East, in the City of Wauwatosa, County of Milwaukee, State of Wisconsin, bounded and described as follows:
Commencing at the Northwest corner of said Northeast 1/4 Section; thence North 87°25'44" East along the north line of said Northeast 1/4 Section, 993.21 feet; thence South 01°58'16" East, 557.82 feet; thence North 87°25'44" East, 292.01 feet to the point of beginning;
Thence continuing North 87°25'44" East, 9.00 feet to the west line of North 112th Street; thence North 01°58'16" West along said west line 168.00 feet; thence South 87°25'44" West, 9.00 feet; thence South 01°58'16" East, 168.00 feet to the point of beginning.

6. LOCATION OF THE TRAIL EASEMENT: A map identifying the location of the Trail Easement within which the public non-motorized bicycle and pedestrian trail will be located is attached and incorporated into this Agreement as Exhibit A.

7. ACCESS RIGHTS: Grantee shall have the right to access and use the Trail Easement for any purpose related to public non-motorized bicycle and pedestrian recreation trail purposes.

8. USE AS EASEMENT FOR PUBLIC PURPOSES: Grantee shall have the right to access, survey, lay, construct, use, operate, maintain, repair, replace, relocate, and/or remove a bicycle and pedestrian recreation trail within the Trail Easement. The bicycle and pedestrian recreation trail within the Trail Easement will be part of a connection to Grantee's overall Safe Routes to School Trail. This bicycle and pedestrian recreation trail is not intended to be considered a public sidewalk as defined by local and state law, but instead will be operated and maintained by Grantee as a public non-motorized bicycle and pedestrian recreation trail.

9. CONSTRUCTION/MAINTENANCE: Grantee will construct, at its cost, the bicycle and pedestrian recreation trail within the Trail Easement. The trail will be constructed in the future after sufficient funds are generated and/or become available to Grantee for such purposes. After the initial construction, Grantee shall be responsible for constructing, maintaining, repairing, and replacing the bicycle and pedestrian recreation trail within the Trail Easement. Grantee is responsible for repairing surface damage within the Trail Easement caused by its use of the Trail Easement. Grantee's responsibilities may include grading and seeding the Trail Easement upon the initial installation of its facilities, and thereafter upon any maintenance, repair, or replacement of any other utility and/or utility structure over, under, and through the Trail Easement. Grantor shall be responsible for repairing any damage to Grantee's recreation trail that are the result of the actions of Grantor, or their agents. After the bicycle and pedestrian recreational trail is constructed, snow removal shall be the responsibility of the Grantor in accordance with City Code 24.12.010. Grantor's financial obligations towards the repair or maintenance of the trail after construction will be in accordance with the City's assessment resolution at the time of such repair or maintenance is required.

10. INTERFERENCE WITH EASEMENT: Grantor, its agents or assigns, shall not interfere in any way with Grantee's use of the Trail Easement, and in particular shall not alter the slope, elevation, or vegetation associated with the Trail Easement, or install or construct any structures or improvements within the Trail Easement, except underground private laterals or private utility connections crossing the Trail Easement, which shall be allowed provided they are subservient to Grantee's use of the Trail Easement.

11. USE OF EASEMENT BY OTHERS: Grantor agrees that Grantee may temporarily assign the construction and maintenance rights identified herein to any contractor, third party, or other assignee who is working with Grantee on construction of or maintenance of the bicycle and pedestrian trail and who demonstrates to Grantee sufficient competence and gives adequate assurances that any work to be performed in or around the easement shall be conducted in a skillful manner, and so not to damage Grantor's Property, and that Grantor's interest in the Trail Easement shall be protected to the same extent as if Grantee itself was performing the construction and maintenance.

12. DEFAULT: If either Grantor or Grantee reasonably believes that the terms of this Easement Agreement have been breached, then written notification of the alleged breach shall be delivered to the other party. Any party in breach shall have thirty (30) days to cure any actual breach. However, Grantee may immediately take any actions it believes is necessary to remedy any situation that materially interferes with the lawful use of the Trail Easement and/or poses a danger or hazard to the public.

13. TERM: This Easement is being granted in perpetuity for public purposes and uses, both current and future, without regard to Grantee's use of the Trail Easement at any particular time. All rights, title and privileges herein granted, including benefits and burdens, shall run with the land and shall be binding upon and inure to the benefit of the Grantor and Grantee, their respective heirs, executors, administrators, successors, assigns, and legal representatives.

14. WAIVER: No delay or omission by any party to this Easement Agreement in exercising any right or power arising out of any default under any of the terms or conditions of this Easement Agreement shall be construed as a waiver of the right or power. A waiver by a party of any of the obligations of the other party shall not be construed to be a waiver of any breach of any other terms or conditions of this Easement Agreement.

15. INVALIDITY: If any term or condition of this Easement Agreement, or the application of this Easement Agreement to any person or circumstance, shall be ruled to be invalid or unenforceable by a court of competent jurisdiction, then the remainder of this Easement Agreement shall not be affected thereby, and each remaining term and condition shall be valid and enforceable to the fullest extent permitted by law.

16. NO THIRD PARTY BENEFICIARY: The terms of this Easement Agreement are for the benefit of the two parties identified, as well as their successors and assigns, and it is not the intention of either Grantor or Grantee that other parties shall acquire any rights to enforce or benefit through this Easement Agreement.

17. MUNICIPAL LIABILITY: Nothing in this Easement Agreement is intended as a waiver of the municipality's right or opportunity to rely upon the municipal limitations and immunities contained within Wisconsin law. Municipal immunities and limitations include, but are not limited to, Sections 345.05, 893.80, and 893.83, Wisconsin Statutes. Such damage limits, caps and immunities are intended to be preserved by the Grantor and incorporated into this agreement by the municipality and its agents, offices, and employees. Such limitations and immunities shall apply to any dispute related to this Easement Agreement, even if the claim is based in tort law.

18. GOVERNING LAW: This Easement Agreement shall be construed and enforced in accordance with the laws of the State of Wisconsin. Venue for any action regarding this Easement Agreement shall be the Milwaukee County, Wisconsin, Circuit Court or, if a federal court action, then the appropriate district and/or branch within which Milwaukee County is located.

19. NOTICES: Any notices required by this Easement Agreement shall be in writing and delivered via certified mail, return receipt requested, as follows. Changes to these addresses shall be in writing. In addition to formal notification, both parties agree to take reasonable measures to keep the other party informed of issues or questions regarding the Trail Easement.

FOR THE GRANTOR:

JILLY'S, LLC
C/O BMW KAR WASH, LLC
Attn: Joe Leger
380 N. Old Woodward Avenue, Suite 205
Birmingham, Michigan 48009

FOR THE GRANTEE:
City of Wauwatosa
c/o Director of Public Works
7725 W. North Avenue
Wauwatosa, Wisconsin 53213

20. AUTHORITY: Grantee affirms that all necessary boards and elected officials have approved the acceptance of this Easement, and that the undersigned have the authority to sign this agreement on behalf of Grantee. Grantor affirms that it has the authority without limitation to enter into this Easement Agreement. The undersigned assert and affirm that they have the authority without limitation to enter into this easement agreement on behalf of their respective party.

SIGNATURE PAGE(S) FOLLOW

IN WITNESS WHEREOF, said Grantor and Grantee have hereunto set their hand and seal the day and year first above written.

**GRANTOR**

Jilly's, LLC,
a Wisconsin limited liability company

By:_____
Jonathan Zimmerman, President

STATE OF WISCONSIN )
) ss.
MILWAUKEE COUNTY )

Personally, came before me this 6th day of January, 2024 the above-named Jonathan Zimmerman, President of Jilly's, LLC, to me known to be such person who executed the foregoing instrument and acknowledged the same, for the purpose herein contained.

CAITLIN SUSAN LAJOIE
Notary Public
State of Wisconsin

Caitlin Susan LaJoie
Notary Public, State of Wisconsin
My Commission expires: 02/09/2024

**GRANTEE**

CITY OF WAUWATOSA

By:_____
_____, Mayor

By:_____
_____, City Clerk

STATE OF WISCONSIN )
) ss.
MILWAUKEE COUNTY )

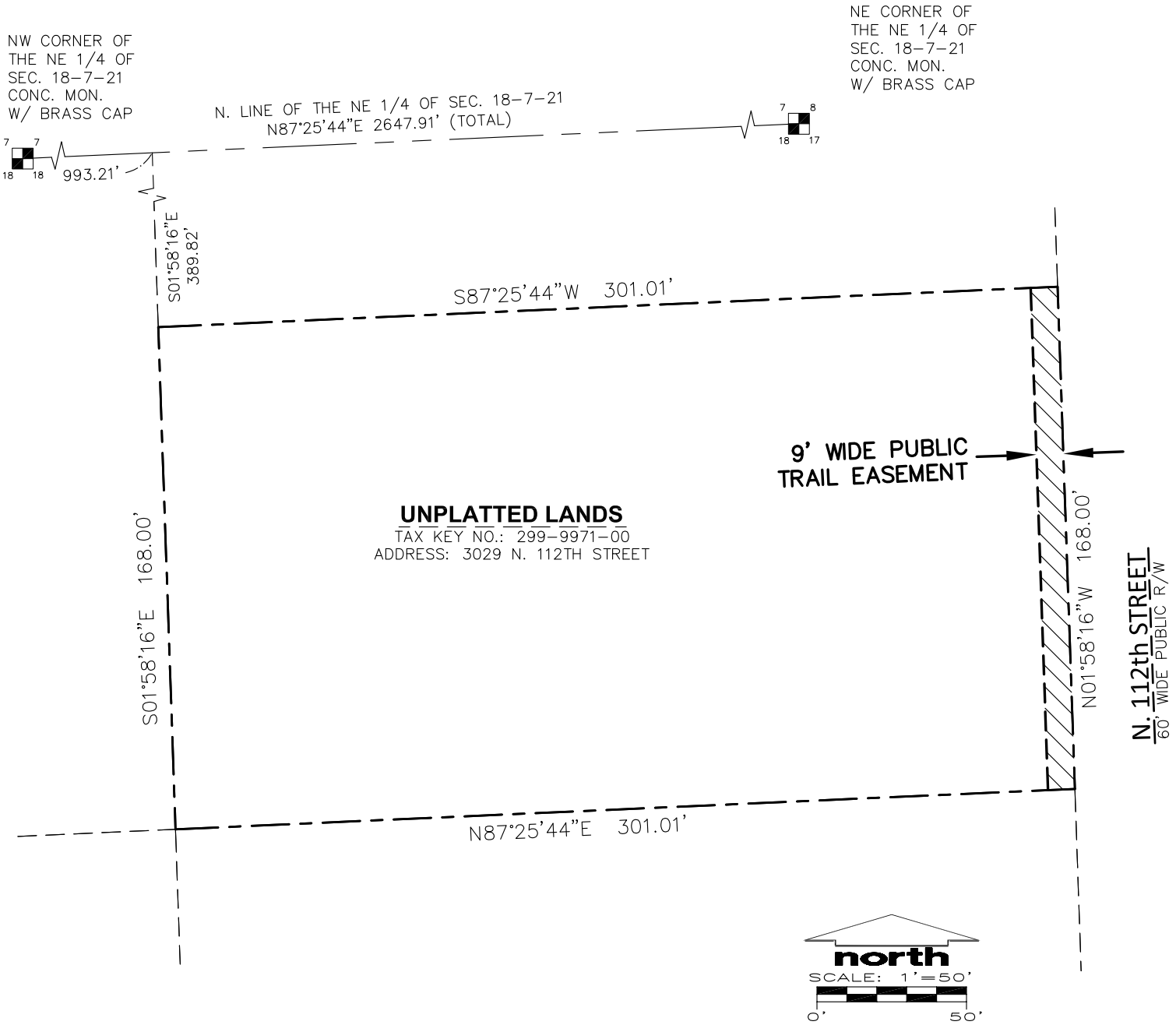
Personally, came before me this _____ day of January, 2024, the above named _____ and _____ of the City of Wauwatosa, Wisconsin, to me known to be such persons who executed the foregoing instrument and acknowledged the same, for the purpose herein contained.

APPROVED AS TO FORM:

_____
_____, City Attorney for Wauwatosa

DRAFTED BY:
Attorney Todd M. Goodwin
New Berlin, Wisconsin
State Bar No. 1027668

# 9' WIDE PUBLIC TRAIL EASEMENT




**DRAFTED BY:**
JSD PROFESSIONAL SERVICES INC
W238N1610 BUSSE RD., STE. 100
WAUKESHA, WI 53188

9' WIDE PUBLIC TRAIL EASEMENT

The East 9 feet of the property described as follow:

That part of the Northeast 1/4 of Section 18, Town 7 North, Range 21 East, in the City of Wauwatosa, County of Milwaukee, State of Wisconsin, bounded and described as follows:

Commencing at a point in the North line of said 1/4 Section, 993.21 feet East of the Northwest corner of said 1/4 Section; running thence Southerly along the West line of the East 1/2 of the East 1/2 of the West 1/2 of said 1/4 Section, 389.82 feet to the place of beginning of the land about to be described; Continuing thence Southerly along the West line of the East 1/2 of the East 1/2 of the West 1/2 of said Northeast 1/4 Section, 168.00 feet to a point; thence Easterly and parallel to the North line of said 1/4 Section 331.01 feet to a point; thence Northerly along the West line of the East 1/2 of said 1/4 Section, 168.00 feet to a point; thence Westerly and parallel to the North line of said 1/4 Section, 331.03 feet to the place of beginning, Except the East 30 feet conveyed to the City of Wauwatosa by Deed recorded as Document No. 3870211.

# Wauwatosa, WI

## Staff Report

**File #:** 24-0035 **Agenda Date:** 1/16/2024 **Agenda #:** 4.

Request for approval of plans and specifications for Contract 24-60, Project 8036, Muellner Building Renovation

**Submitted by:**
David Simpson
**Department:**
Public Works

WHEREAS, it is the sense of the Board of Public Works of the City of Wauwatosa that it is necessary to perform Improvement to the Muellner Building in the City of Wauwatosa and work incidental thereto under Contract 24-60, Project 8036, Muellner Building Renovation.

NOW, THEREFORE, BE IT RESOLVED, the Board of Public Work of the City of Wauwatosa hereby approves the following:

Section 1. The plans and specifications and form of contract and bond, together with the contract documents submitted therewith for furnishing all labor, materials, and equipment for the Muellner Building Renovation Improvements and work incidental thereto, be and the same are hereby approved.

Section 2. That the work is intended to be done during the 2024 construction season in the City of Wauwatosa, all in accordance with said plans and specifications.

Section 3. That the work is to be let to the lowest responsible bidder following competitive bidding therefore.

Section 4. That the City Clerk be and is herby authorized and instructed to advertise for Contract 24-60/Project 8036, Muellner Building Renovation on January 24th, 2024 and January 31st, 2024. Bids will be opened on February 14th, 2024 and to provide in so doing that bids may be submitted with a contract and bond, with sureties, as prescribed by the form furnished, complete with the exception of the signatures on the part of the City; and in lieu of the foregoing provision with the bidder may accompany their bid with a certified check equal to five percent of the bid, payable to the City as a guarantee that if their bid is accepted, they will execute and file the property contract and bond within the days after award, all in accordance with the provision of the Wisconsin Statutes.

ISSUE DATE:  DECEMBER 22, 2023

CONSTRUCTION DOCUMENTS

# MUELLNER BUILDING RENOVATION

**Kahler Slater**

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

KAHLER SLATER PROJECT: 223010.00
WAUWATOSA PROJECT: #8036; CONTRACT #24-60

## Issued for Board of Public Works Approvals Only

## Not To Be Used For Bidding

## CODE ANALYSIS SUMMARY

1. PROJECT DESCRIPTION
   THIS PROJECT INCLUDES EXTERIOR AND INTERIOR IMPROVEMENTS THE HART PARK MUELLNER BUILDING.

   HART PARK MUELLNER BUILDING:
   - THIS WORK INCLUDES RECONFIGURING AND REMODELING OF VARIOUS INTERIOR SPACES
   - REPLACEMENT OF EXTERIOR RAILINGS AT BALCONY AND ROOF EDGE
   - REPLACEMENT OF EXTERIOR WINDOWS, LOUVERS, DOORS
   - REPLACEMENT OF THE RINK FLOOR SLAB AND RINK PIPING SYSTEM
   - ADDITION OF A NEW RINK DEHUMIDIFICATION UNIT
   - REPLACEMENT OF EXISTING SPLIT UNITS AT SECOND LEVEL

2. APPLICABLE BUILDING CODES
   - WISCONSIN COMMERCIAL BUILDING CODE SPS 360 TO 366
   - 2015 INTERNATIONAL BUILDING CODE (IBC) - ALTERATION 2
   - 2015 INTERNATIONAL EXISTING BUILDING CODE (IEBC) - REPAIRS AND ALTERATION 2
   - 2015 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
   - ICC/ANSI A117.1-2009 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES
   - U.S. DEPARTMENT OF JUSTICE 2010 ADA STANDARDS FOR ACCESSIBLE DESIGN

3. OCCUPANCY GROUPS
   - HART PARK ADMINISTRATION BUILDING - ASSEMBLY GROUP A-3 - COMMUNITY HALL

4. EXISTING BUILDING AREA
   - EXISTING HART PARK BUILDING AREA

   | | |
   |---|---|
   | BASEMENT: | 3,330 SF |
   | LEVEL 01: | 27,262 SF |
   | LEVEL 02: | 3,330 SF |
   | TOTAL EXISTING BUILDING AREA: | 33,922 SF |

5. AREA OF WORK
   - HART PARK - AREAS OF REMODELING: (ALTERATION LEVEL 2)

   | | |
   |---|---|
   | FIREFLY ROOM : | 1,550 SF |
   | KITCHEN: | 282 SF |
   | GARDEN VIEW ROOM: | 715 SF |
   | PARK VIEW ROOM: | 923 SF |
   | TOSA ROOM: | 9,041 SF |
   | RIVER VIEW ROOM: | 2,130 SF |
   | TOTAL REMODELED AREA: | 14,641 SF (44%) |

5. CLASS OF CONSTRUCTION
   - HART PARK MUELLNER BUILDING - IBC CONSTRUCTION TYPE 3B (EXISTING EQUIVALENT CONSTRUCTION TYPE TO REMAIN)
   - FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS

   | | |
   |---|---|
   | COLUMNS: | 0 HR. |
   | ROOF BEAMS: | 0 HR. |
   | FLOORS: | 0 HR. |
   | BEARING EXTERIOR WALLS: | 2 HR. |
   | NONBEARING EXTERIOR WALLS: | 0 HR. |

6. FIRE PROTECTION
   - HART PARK MUELLNER BUILDING IS PARTIAL SPRINKLERED W/ FIRE ALARM. MAINTENANCE BUILDING ANNEX AND UTILITIES ARE NOT SPRINKLERED AND DOES NOT HAVE FIRE ALARM. DUE TO REMODEL AREA LESS THAN 50% OF WORK AREA, NO NEW SPRINKLERING IS REQUIRED.

7. OCCUPANT LOAD, EXIT EGRESS & TOILET COUNTS
   - EXISTING USE, OCCUPANT LOAD AND EXIT EGRESS IS UNAFFECTED BY THE REMODELING PROJECT
     - THE ROOM USE & LOCATIONS HAVE NOT CHANGED
     - THE OCCUPANT LOAD HAS NOT CHANGED
     - TOILET COUNT IS NOT BEING ALTERED AND WILL BE THE SAME ONCE REMODELING PROJECT IS COMPLETE

8. EXTERIOR ENVELOPE IMPROVEMENTS
   - THE PROJECT INCLUDES SELECTIVE EXTERIOR ENVELOPE UPGRADES AND INFILL, INCLUDING NEW WINDOWS AND DOORS AS INDICATED ON THE DRAWINGS, AND MINOR EXTERIOR WALL INFILL AT REMOVED DOORS. COMPONENT U-VALUES FOR EACH SYSTEM ARE IDENTIFIED BELOW TO MEET OR EXCEED REQUIREMENTS OF IECC C402.1.4 AND C402.4:

   | | |
   |---|---|
   | WINDOWS (SELECTIVE REPLACEMENT): | U-0.290 |
   | DOORS (SELECTIVE REPLACEMENT): | U-0.360 |
   | WALL ASSEMBLY (SELECTIVE INFILL): | U-0.026 |
   | SLAB ON GRADE (SELECTIVE REPLACEMENT): | U-0.047 |

THROUGHOUT THE DOCUMENTS THESE ABBREVIATIONS ARE USED TO DESCRIBE PARTIES, MATERIALS, WEIGHTS, OR DIRECTIONS RELATED TO THE CONTRACT DOCUMENTS.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A/C | AIR CONDITIONING | EA | EACH | L | LENGTH, LONG | SAB | SOUND ATTENUATION BATTS |
| ACM PNL | ALUMINUM COMPOSITE MATERIAL | EIFS | EXTERIOR INSULATION FINISH SYSTEM | LAV | LAVATORY | SAG | SUPPLY AIR GRILLE |
| | PANEL | EJ | EXPANSION JOINT | LBS | POUND(S) | SC | SOLID CORE |
| ACS PNL | ACCESS PANEL | EL | ELEVATION | LKR | LOCKER | SCHED | SCHEDULE |
| ACT | ACOUSTICAL CEILING TILE | ELEC | ELECTRIC / ELECTRICAL | LT WT | LIGHTWEIGHT | SD | SOAP DISPENSER |
| ADDM | ADDENDUM | ELEV | ELEVATOR | LGB | LEAD LINED GYPSUM BOARD | SECT | SECTION |
| ADJ | ADJUSTABLE | EMER | EMERGENCY | | | SFRM | SPRAY FIRE RESISTIVE MATERIALS |
| ADO | AUTOMATIC DOOR OPERATOR | EP | ELECTRICAL PANEL | MAS | MASONRY | SHR | SHOWER |
| AFF | ABOVE FINISHED FLOOR | EQ | EQUAL | MATL | MATERIAL | SHT | SHEET |
| ALT | ALTERNATE | EQUIP | EQUIPMENT | MAX | MAXIMUM | SHT MTL | SHEET METAL |
| ALUM | ALUMINUM | ES | ELECTRIC STRIKE | MECH | MECHANICAL | SHV | SHELF, SHELVING |
| ANOD | ANODIZED | ETR | EXISTING TO REMAIN | MED | MEDIUM | SIM | SIMILAR |
| APPROX | APPROXIMATE | EWC | ELECTRIC WATER COOLER | MFR | MANUFACTURER | SND | SANITARY NAPKIN DISPENSER |
| ARCH | ARCHITECT | EXH FN | EXHAUST FAN | MH | MANHOLE | SNDU | SANITARY NAPKIN DISPOSAL UNIT |
| AUX | AUXILIARY | EXIST | EXISTING | MID | MIDDLE | S&P | SHELF & POLE |
| AVG | AVERAGE | EXP | EXPANSION | MIN | MINIMUM | SPEC | SPECIFICATION |
| | | EXPO | EXPOSED | MIRR | MIRROR | SPF | SPRAY POLYURETHANE FOAM |
| BD | BOARD | EXT | EXTERIOR | MISC | MISCELLANEOUS | SPKR | SPEAKER |
| BITUM | BITUMINOUS | | | MO | MASONRY OPENING | SQ | SQUARE |
| BLDG | BUILDING | FA | FIRE ALARM | MS | METAL STUD | SS | SOLID SURFACING |
| BLKG | BLOCKING | FD | FLOOR DRAIN | MSB | MOP SERVICE BASIN | SSK | SERVICE SINK |
| BLKHD | BULKHEAD | FE | FIRE EXTINGUISHER | MTD | MOUNTED | SST | STAINLESS STEEL |
| BM | BEAM | FEC | FIRE EXTINGUISHER CABINET | MTL | METAL | STC | SOUND TRANSMISSION COEFFICIENT |
| BM | BENCHMARK | FEP | FINISHED END PANEL | MW | MINERAL WOOL | STD | STANDARD |
| BO __ | BOTTOM OF __(ITEM)__ | FF | FINISH FACE | | | STL | STEEL |
| BO | BY OTHERS | FGL | FIBERGLASS | NIC | NOT IN CONTRACT | STOR | STORAGE |
| BRG | BEARING | FHC | FIRE HOSE CABINET | NO | NUMBER | STRUCT | STRUCTURAL |
| BS | BOTH SIDES | FIN | FINISH | NOM | NOMINAL | SUSP | SUSPENDED |
| BT JNT | BUTT JOINT | FIXT | FIXTURE | NTS | NOT TO SCALE | SW | SHAFT WALL SYSTEM |
| BTWN | BETWEEN | FL | FLOOR LINE | | | | |
| | | FLR | FLOOR | O/ | OVER | T | TREAD |
| CAS | CARD ACCESS SYSTEM | FLUOR | FLUORESCENT | OA | OVERALL | TEMP | TEMPORARY |
| CB | CATCH BASIN | FO __ | FACE OF __(ITEM)__ | OC | ON CENTER | T&G | TONGUE & GROOVE |
| CB | CONSTRUCTION BULLETIN | FOF | FACE OF FINISH | OD | OUTSIDE DIAMETER | THK | THICKNESS |
| CF/CI | CONTRACTOR FURNISHED / | FOM | FACE OF MASONRY | OF/CI | OWNER FURNISHED / | TLT | TOILET |
| | CONTRACTOR INSTALLED | FP | FIREPROOF, FIRE PROTECTION | | CONTRACTOR INSTALLED | TO __ | TOP OF __(ITEM)__ |
| CF/OI | CONTRACTOR FURNISHED / | FR | FRAME | OF/OI | OWNER FURNISHED / | TOC | TOP OF CONCRETE |
| | OWNER INSTALLED | FT | FOOT OR FEET | | OWNER INSTALLED | TOF | TOP OF FOOTING |
| CFMF | COLD-FORMED METAL FRAMING | FTG | FOOTING | OFD | OVERFLOW DRAIN | TOP | TOP OF PAVEMENT |
| CG | CORNER GUARD | FURG | FURRING | OH | OVERHEAD | TOS | TOP OF STEEL |
| CH | COAT HOOK | FV | FIELD VERIFY | OPNG | OPENING | TOW | TOP OF WALL |
| CJ | CONTROL JOINT | | | OPP | OPPOSITE | TPD | TOILET PAPER DISPENSER |
| CL | CENTER LINE | GA | GAGE | ORD | OVERFLOW ROOF DRAIN | TYP | TYPICAL |
| CLG | CEILING | GAL | GALLON | | | | |
| CLO | CLOSET | GALV | GALVANIZED | PCT | PORCELAIN CERAMIC TILE | UCR | UNDERCOUNTER REFRIGERATOR |
| CLR | CLEAR | GB | GRAB BAR | PED | PEDESTAL | UL | UNDERWRITER'S LABORATORY |
| CMU | CONCRETE MASONRY UNIT | GC | GENERAL CONTRACTOR | PERIM | PERIMETER | UNO | UNLESS NOTED OTHERWISE |
| CO | CASED OPENING | GFRC | GLASS FIBER REINFORCED CONCRETE | PL | PLATE | UR | URINAL |
| COL | COLUMN | GFRG | GLASS FIBER REINFORCED GYPSUM | PL | PROPERTY LINE | | |
| CONC | CONCRETE | GL | GLASS | PLAM | PLASTIC LAMINATE | VAV | VARIABLE AIR VOLUME |
| CONT | CONTINUE, CONTINUOUS | GM BD | GLASS MAT WATER RESISTANT BOARD | PLBG | PLUMBING | VB | VAPOR BARRIER |
| CORR | CORRIDOR | GYP BD | GYPSUM BOARD | PLYWD | PLYWOOD | VCT | VINYL COMPOSITION TILE |
| CPT | CARPET | | | POC | POINT OF CONNECTION | VERT | VERTICAL |
| CRS | COURSE, COURSES | HB | HOSEBIBB | PR | PAIR | VEST | VESTIBLE |
| CT | CERAMIC TILE | HDW | HARDWARE | PREFAB | PREFABRICATED | VIF | VERIFY IN FIELD |
| CTR | CENTER | HDWD | HARDWOOD | PRELIM | PRELIMINARY | VR | VAPOR RETARDER |
| CUH | CABINET UNIT HEATER | HM | HOLLOW METAL | PSF | POUNDS PER SQUARE FOOT | VWC | VINYL WALL COVERING |
| | | HORIZ | HORIZONTAL | PT | PAINT | | |
| DBL | DOUBLE | HP | HORSE POWER | PTD | PAPER TOWEL DISPENSER | W/ | WITH |
| DEFS | DIRECTED-APPLIED EXTERIOR | HR | HOUR | PTDR | PAPER TOWEL DISPENSER | WC | WATERCLOSET |
| | FINISH SYSTEM | HTR | HEATER | | WITH RECEPTACLE | WD | WOOD |
| DEMO | DEMOLITION / DEMOLISH | HVAC | HEATING, VENTILATION, & AIR | PTM | PATCH TO MATCH | WF | WIDE FLANGE |
| DEP | DEPRESSED | | CONDITIONING | | | WH | WATER HEATER |
| DF | DRINKING FOUNTAIN | | | QT | QUARRY TILE | WLM | WOOD LOOK METAL |
| DIA | DIAMETER | ID | INSIDE DIAMETER | | | W/O | WITHOUT |
| DIAG | DIAGONAL | IN | INCH | R | RADIUS | WS | WORKSTATION |
| DIM | DIMENSION | INCL | INCLUDE, INCLUDING | R | RISER | WWF | WELDED WIRE FABRIC |
| DISP | DISPENSER | INT | INTERIOR | RA | RETURN AIR | WWM | WELDED WIRE MESH |
| DIV | DIVISION | | | RC | RESILIENT CHANNEL | | |
| DN | DOWN | JAN | JANITOR | RD | ROOF DRAIN | YD | YARD(S) |
| DS | DOWNSPOUT | JNT | JOINT | REF | REFERENCE | | |
| DT | DRAIN TILE | | | REF | REFRIGERATOR | Z | "Z" FURRING CHANNEL |
| DW | DISHWASHER | KO | KNOCK OUT | REFL | REFLECTED | | |
| DWG | DRAWING | KS | KNEE SPACE | REINF | REINFORCED / REINFORCEMENT | | |
| DWR | DRAWER | | | REQD | REQUIRED | | |
| | | | | REV | REVISION | | |
| | | | | RFI | REQUEST FOR INFORMATION | | |
| | | | | RM | ROOM | | |
| | | | | RO | ROUGH OPENING | | |
| | | | | ROW | RIGHT OF WAY | | |
| | | | | RTU | ROOF TOP UNIT | | |

## SYMBOL IDENTIFICATIONS

| SYMBOL NAME | SYMBOL MARK | NOTES | SYMBOL NAME | SYMBOL MARK | NOTES |
|---|---|---|---|---|---|
| DETAIL REFERENCE | 1 / A101 | DRAWING NUMBER<br>SHEET NUMBER | NEW STRUCTURAL GRID-LINE REFERENCE | A | GRID-LINE NUMBER OR LETTER |
| DETAIL MANUAL REFERENCE | 2/A101 | DETAIL MANUAL SHEET NUMBER | EXISTING STRUCTURAL GRID LINE REFERENCE | A | EXISTING GRID-LINE NUMBER OR LETTER |
| SECTION REFERENCE | 1 / A101 | DRAWING NUMBER<br>SHEET NUMBER | ELEVATION REFERENCE | 21 A101 22 | SHEET NUMBER<br>DRAWING NUMBER |
| FLOOR PLAN KEYNOTE REFERENCE | 1 | FLOOR PLAN KEY NOTE NUMBER | REVISION REFERENCE | 1 / ADD. | REVISION NUMBER<br>REVISION PACKAGE |
| ROOM REFERENCE | OFFICE / 0102 | ROOM NAME<br>ROOM NUMBER | REVISION CLOUD | | REVISION CLOUD |
| DOOR REFERENCE | 0102A | DOOR NUMBER | FLOOR PLAN ELEVATION TARGET | EL. | FLOOR ELEVATION |
| PARTITION TYPE REFERENCE | 1A | PARTITION NUMBER | BUILDING SECTION ELEVATION TARGET | T.O. PRECAST<br>CONC. PARAPET<br>EL. +100'-0" | REMARK LINE 1<br>REMARK LINE 2<br>TARGET ELEVATION |
| CEILING HEIGHT REFERENCE | TYPE / 8'-0" | CEILING TYPE<br>CEILING HEIGHT | FLOOR FINISH MATERIAL REFERENCE | | MATERIAL CODE<br>REMARK |

## SHEET INDEX

| Sheet Number | Sheet Name |
|---|---|
| 01 - GENERAL | |
| G000 | COVER SHEET |
| 02 - DEMOLITION | |
| AD100 | OVERALL DEMO PLANS |
| AD120 | OVERALL DEMO REFLECTED CEILING PLANS |
| AD200 | DEMO BUILDING ELEVATIONS |
| AD250 | DEMO INTERIOR ELEVATIONS & DETAILS |
| 03 - ARCHITECTURAL | |
| A020 | PARTITION SCHEDULE AND LEGEND |
| A100 | OVERALL FLOOR PLANS |
| A120 | OVERALL REFLECTED CEILING PLANS |
| A130 | OVERALL FINISH PLANS |
| A131 | ENLARGED FINISH PLANS & DETAILS |
| A200 | BUILDING ELEVATIONS |
| A250 | INTERIOR ELEVATIONS |
| A251 | INTERIOR ELEVATIONS |
| A320 | WALL SECTIONS |
| A500 | DOOR SCHEDULE & EXTERIOR DETAILS |
| A501 | WINDOW TYPES |
| A502 | WINDOW & DOOR DETAILS |
| A550 | EXTERIOR & INTERIOR DETAILS |
| A551 | MILLWORK DETAILS |
| A552 | MILLWORK DETAILS |
| A650 | INTERIOR WINDOW TYPES & DETAILS |
| A900 | DESIGN RENDERINGS |
| 04 - STRUCTURAL | |
| S001 | GENERAL STRUCTURAL NOTES |
| S003 | FLOOR FRAMING PLAN |
| S100 | ROOF FRAMING PLAN |
| S400 | STRUCTURAL DETAILS |
| 05 - FIRE PROTECTION | |
| FP000 | FIRE PROTECTION TITLE SHEET |
| FP201 | FIRST FLOOR FIRE PROTECTION PLAN |
| FPD201 | FIRST FLOOR FIRE PROTECTION DEMOLITION PLAN |
| 06 - MECHANICAL | |
| M000 | MECHANICAL SYMBOLS AND SHEET INDEX |
| M001 | MECHANICAL NOTES AND ABBREVIATIONS |
| M201 | FIRST FLOOR MECHANICAL PLAN |
| M202 | SECOND FLOOR MECHANICAL PLAN |
| M600 | MECHANICAL DETAILS |
| M701 | HVAC SCHEDULES |
| MD201 | FIRST FLOOR MECHANICAL DEMOLITION PLAN |
| MD202 | SECOND FLOOR MECHANICAL DEMOLITION PLAN |
| 07 - PLUMBING | |
| P000 | PLUMBING TITLE SHEET |
| P199 | FOUNDATION PLUMBING PLAN |
| P201 | FIRST FLOOR PLUMBING PLAN |
| P202 | SECOND FLOOR PLUMBING PLAN |
| P500 | PLUMBING DETAILS, SCHEDULES AND ISOMETRICS |
| PD201 | FIRST FLOOR PLUMBING DEMOLITION PLAN |
| PD202 | SECOND FLOOR PLUMBING DEMOLITION PLAN |
| 08 - ELECTRICAL | |
| E000 | ELECTRICAL SYMBOLS AND SHEET INDEX |
| E200 | LIGHTING PLANS |
| E210 | POWER PLANS |
| E211 | POWER ROOF PLAN |
| E220 | SYSTEMS PLANS |
| E300 | ENLARGED ELECTRICAL PLANS |
| E400 | ELECTRICAL ONE LINE DIAGRAM |
| E401 | ELECTRICAL ONE LINE DIAGRAM |
| E402 | ELECTRICAL ONE LINE DIAGRAM |
| E520 | ELECTRICAL DETAILS |
| E601 | ELECTRICAL SCHEDULES |
| E602 | ELECTRICAL SCHEDULES |
| ED200 | ELECTRICAL DEMOLITION PLANS |
| 09 - ICE | |
| R001 | CURLING RINK LEGEND AND SYMBOLS |
| R100 | CURLING RINK FLOOR PLAN |
| R500 | CURLING RINK DETAILS |
| R501 | CURLING RINK DETAILS |
| R600 | SECONDARY REFRIGERANT FLOW DIAGRAM |
| RD100 | CURLING RINK DEMOLITION PLAN |


ARCHITECT:
KAHLER SLATER, INC.
790 N. WATER ST. SUITE 1700
MILWAUKEE, WI 53202
(414) 272-2000


WISCONSIN JEFFREY J PIETTE A-8620 ARCHITECT
12/22/2023

ARCHITECTURAL DRAWINGS


STRUCTURAL ENGINEER:
REYN ENGINEERING
131 W. SEEBOTH ST. SUITE 220
MILWAUKEE, WI 53204
(414) 254-8526


WISCONSIN PATRICK D. REYNOLDS E-36645 WAUWATOSA WI PROFESSIONAL ENGINEER
12/22/2023

STRUCTURAL DRAWINGS


MEP ENGINEERS:
RING & DUCHATEAU
17400 CAPITOL DR.
BROOKFIELD, WI 53045
(414) 778-1700


WISCONSIN JEFFREY C. WEGNER D 1900 P GRAFTON, WI DESIGNER
12/22/2023

PLUMBING DRAWINGS


MEP ENGINEERS:
RING & DUCHATEAU
17400 CAPITOL DR.
BROOKFIELD, WI 53045
(414) 778-1700


WISCONSIN MICHAEL A. BARTLEY D 2037 H MILWAUKEE, WI DESIGNER
HVAC
12.22.2023

MECHANICAL DRAWINGS


MEP ENGINEERS:
RING & DUCHATEAU
17400 CAPITOL DR.
BROOKFIELD, WI 53045
(414) 778-1700


WISCONSIN HEATHER ST. LEDGER E-44873 MILWAUKEE, WI PROFESSIONAL ENGINEER
12-22-23

ELECTRICAL DRAWINGS


ICE ENGINEERS:
B32 ENGINEERING GROUP
2211 O'NEIL RD.
HUDSON, WI 54016
(651) 256-3090


WISCONSIN SCOTT A. WARD 34714-006 ST. PAUL, MN PROFESSIONAL ENGINEER
12-22-23

RINK DRAWINGS

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No. 223010.00
CITY OF WAUWATOSA

Sheet Title
COVER SHEET


Copyright © 2020 Kahler Slater, Inc. All rights reserved.


790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
G000

12/20/2023 4:41:52 PM

Kahler Slater

## DEMOLITION GENERAL NOTES:

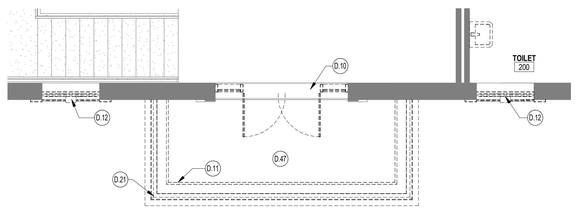
1. AREAS OF DEMOLITION ARE INDICATED GRAPHICALLY BY DASHED LINES. KEYED NOTES DO NOT IDENTIFY ALL DEMOLITION CONDITIONS. KEYED NOTES ARE INTENDED TO IDENTIFY SELECTIVE DEMOLITION IN SPECIFIC AREAS. EXISTING CONSTRUCTION TO REMAIN IS SHOWN WITH CONTINUOUS LINES.
2. DASHED LINES INDICATE DEMOLITION AREAS FOR ARCHITECTURAL COMPONENTS INCLUDING BUT NOT LIMITED TO WALLS, STUDS, DOORS, DOOR FRAMES, CABINETS, COUNTERS, ETC. CEILINGS, GRID AND TILE SHOULD BE COMPLETELY DEMOLISHED IN AREAS OF DEMOLITION UNLESS OTHERWISE NOTED. EXISTING FLOOR FINISH SHOULD BE COMPLETELY REMOVED IN AREAS OF DEMOLITION UNLESS OTHERWISE NOTED.
3. EXISTING AREAS OF DEMOLITION REFLECT INFORMATION AND CONDITIONS ACCORDING TO AVAILABLE ORIGINAL BUILDING PLANS. EXISTING CONDITIONS AND DIMENSIONS SHALL BE FIELD VERIFIED BY CONTRACTORS AND DISCREPANCIES REPORTED TO THE OWNER AND ARCHITECT.
4. EXISTING WALLS, PARTITIONS, FLOOR LINES, DOORS AND FRAMES THAT REMAIN AND EXISTING FLOOR AND WALL FINISHES THAT ARE SCHEDULED TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION AND CONSTRUCTION.
5. WHERE WALLS OR PARTITIONS ARE INDICATED TO BE REMOVED, REMOVE ENTIRE WALL OR PARTITIONS AS WELL AS DUCTS, PIPING, CONDUITS AND OTHER ELEMENTS IN OR ON THEM WHICH MAY OR MAY NOT BE SPECIFICALLY IDENTIFIED, UNLESS OTHERWISE NOTED. COORDINATE WITH OWNER ALL EQUIPMENT TO BE SALVAGED.
6. SCOPE OF DEMOLITION AND REMOVAL WORK SHALL NOT BE LIMITED BY THESE DRAWINGS BUT SHALL INCLUDE WORK NECESSARY TO FACILITATE NEW CONSTRUCTION.
7. CONTRACTOR TO PROTECT AREAS ADJACENT TO DEMOLITION DURING CONSTRUCTION.
8. ALL DEMO'D EXISTING STONE TO BE SALVAGED FOR RE-USE. SEE SPECIFICATIONS FOR ADDITIONAL INFO.
9. REMOVE EXISTING FLOORING AT ALL ROOMS SCHEDULED TO RECEIVE NEW FLOOR. REF: FINISH PLANS AND SCHEDULE.

## KEYNOTES - DEMOLITION PLAN

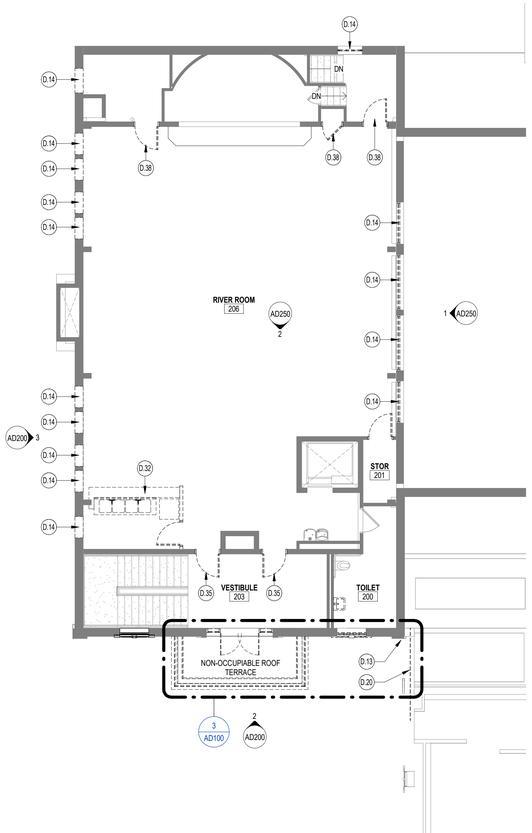
| | |
|---|---|
| D.10 | REMOVE DOOR, SIDE LITES, AND TRANSOM - PREP OPENING FOR NEW DOOR |
| D.11 | REMOVE METAL RAILING. PREP ROOF FOR NEW RAILING TO BE INSTALLED |
| D.12 | REMOVE WINDOW AND ASSOCIATED INFILL PANEL. PREP OPENING FOR NEW WINDOW |
| D.13 | REMOVE EXISTING MORTAR AND SEALANT AND PREPARE JOINT FOR EXPANSION MATERIAL |
| D.14 | REMOVE EXISTING WINDOW. PREP OPENING FOR NEW WINDOW |
| D.15 | REMOVE EXISTING HOLLOW METAL DOOR, CMU BOND BEAM, AND WALL ABOVE COORDINATE AND SEQUENCE WORK WITH ADJACENT WINDOW. PROVIDE TEMPORARY SUPPORT OF WALL/WINDOW OPENING AS REQUIRED |
| D.16 | REMOVE GLASS BLOCK WINDOW. PREP OPENING FOR CMU INFILL |
| D.20 | REMOVE WOOD RAILING AND METAL BRACKET, PATCH AND REPAIR EPDM ROOF IN RAILING LOCATION |
| D.21 | REMOVE EXISTING METAL GUTTER AND DOWSPOUT |
| D.23 | REMOVE EXISTING WINDOW. PREP OPENING FOR NEW INFILL WALL |
| D.24 | REMOVE PORTION OF EXISTING WALL BELOW WINDOW AND TRACK. REFER TO DEMO ELEVATIONS FOR EXTENTS |
| D.25 | REMOVE EXISTING WALLS AND DOORS |
| D.26 | REMOVE EXISTING CASEWORK |
| D.27 | REMOVE EXISTING OPERABLE PARTITION AND TRACK. PATCH AND REPAIR GYP. BD. BULKHEAD |
| D.28 | REMOVE EXISTING DOOR. INFILL WITH NEW PARTITION AS NOTED ON OVERALL FLOOR PLAN |
| D.29 | REMOVE EXISTING DOOR. INFILL WITH EXTERIOR STONE VENEER WALL ASSEMBLY AS NOTED ON OVERALL PLAN |
| D.30 | REMOVE EXISTING OVERHEAD COILING DOOR. PREP OPENING FOR NEW STOREFRONT WINDOW AND DOOR |
| D.32 | REMOVE EXISTING KITCHENETTE MILLWORK, PLUMBING FIXTURES, WALL AND DOOR |
| D.34 | REMOVE EXISTING DOOR. PREP OPENING FOR NEW EXTERIOR FRAME AND DOOR |
| D.35 | REMOVE EXISTING DOOR PANEL(S). PREP EXISTING FRAME AND HARDWARE FOR INSTALL OF NEW DOOR PANEL(S) |
| D.36 | PREP EXISTING DOOR AND FRAME FOR NEW ACCESS CONTROL (CARD READER) TO BE ADDED |
| D.37 | DEMO EXISTING WINDOW FRAME AND TRIM. PREP OPENING FOR NEW FURRING INFILL |
| D.38 | REMOVE EXISTING DOOR PANEL. STRIP EXISTING FINISH AND PREP FOR PAINT |
| D.41 | REMOVE EXISTING COUNTERTOP. BOTH WORK SURFACES AND TRANSACTION COUNTER |
| D.42 | REMOVE AND SALVAGE WINDOW. REINSTALL AFTER NEW COUNTERTOP IS IN PLACE |
| D.43 | REMOVE EXISTING FINISH FLOOR. PREP FOR NEW FLOORING |
| D.44 | REMOVE EXISTING TILE FLOOR EAST OF GROUT JOINT INDICATED. PREP FOR NEW FLOORING |
| D.46 | DEMO WALL BELOW EXISTING WINDOW DOWN TO THE SLAB. PREP FOR NEW INFILL STUD WALL |
| D.47 | REMOVE EXISTING ROOFING MEMBRANE. PREP FOR INSTALLATION OF NEW MEMBRANE |
| D.48 | REMOVE EXISTING ACCESS PANEL, DOORS, TRIM, SHELVES AND SUPPORTS, AND DUMBWAITER SYSTEM |

## DEMOLITION PLAN LEGEND

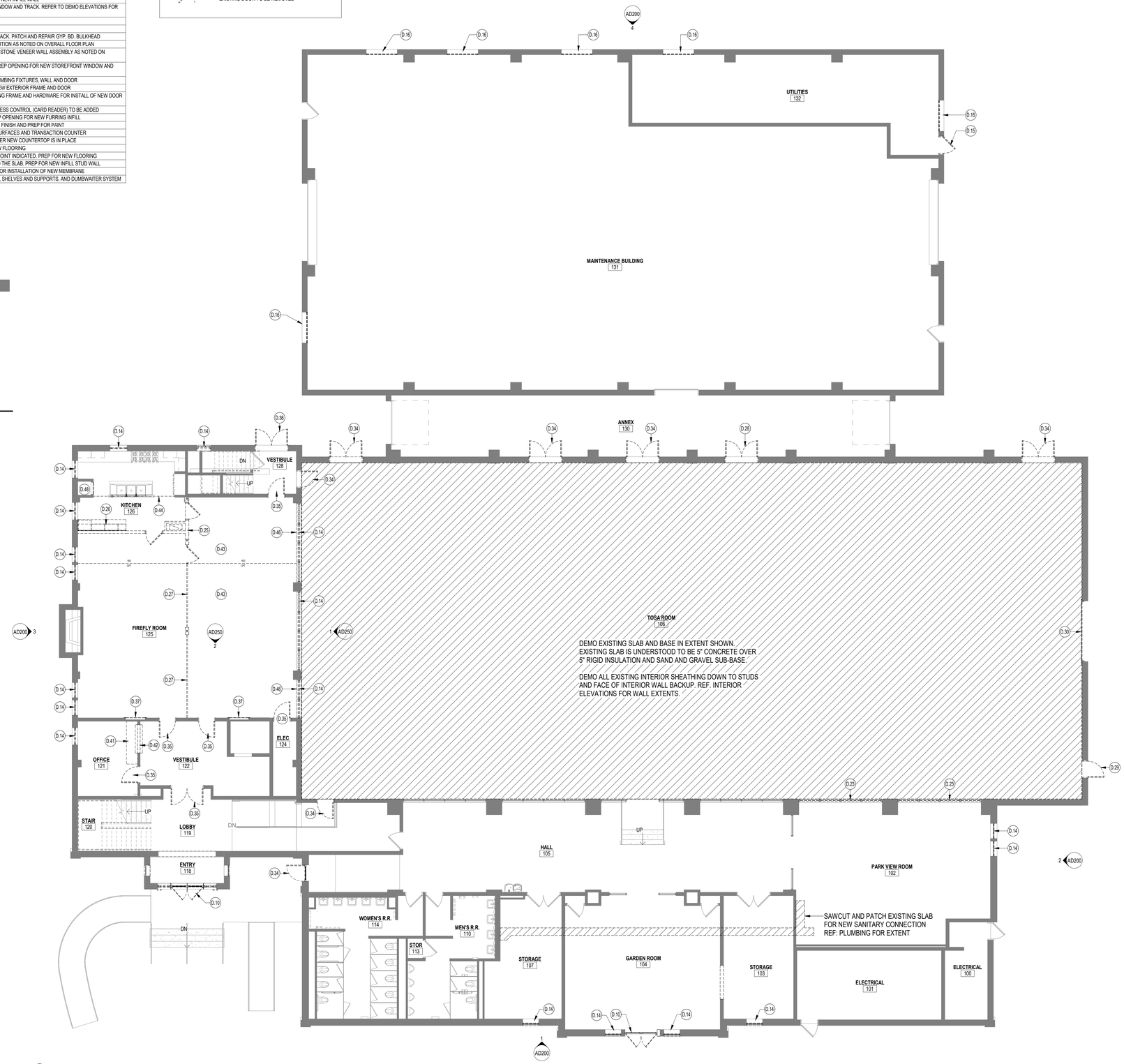
- EXISTING CONSTRUCTION TO REMAIN
- EXISTING CONSTRUCTION TO BE DEMOLISHED
- EXISTING DOOR TO REMAIN
- EXISTING DOOR TO BE REMOVED




3 SECOND FLOOR PLAN - DEMOLITION ENLARGED
1/4" = 1'-0"




2 SECOND FLOOR PLAN - DEMOLITION
1/8" = 1'-0"




1 FIRST FLOOR PLAN - DEMOLITION
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
OVERALL DEMO PLANS

NORTH

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
AD100

Kahler Slater

## DEMO RCP LEGEND

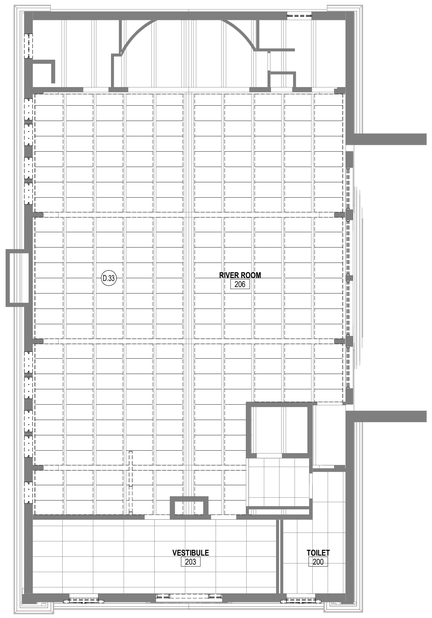
| | |
|---|---|
| EXISTING CEILING SYSTEM TO REMAIN | EXISTING LIGHT FIXTURES TO REMAIN |
| EXISTING CEILING SYSTEM TO BE DEMOLISHED | EXISTING LIGHT FIXTURES TO BE DEMOLISHED |

## KEYNOTES - DEMOLITION PLAN

| | |
|---|---|
| D.27 | REMOVE EXISTING OPERABLE PARTITION AND TRACK. PATCH AND REPAIR GYP. BD. BULKHEAD |
| D.31 | REMOVE EXISTING SOFFIT, TYP. FOR LENGTH OF TOSA ROOM |
| D.33 | REMOVE EXISTING CEILING GRID AND TILES. TYP. EXISTING GRID AND TRIM TO BE SALVAGED AND PAINTED FOR INSTALLATION WITH NEW CEILING TILES |
| D.40 | REMOVE ALL EXISTING PLASTIC CEILING SHEETING AND SUB-FRAMING. FILL FASTENER HOLES AND PREP EXISTING WOOD STRUCTURE AND DECK FOR SEALING |
| D.45 | DEMO EXISTING ROOF DECK & STRUCTURE AS REQUIRED FOR NEW DUCT PENETRATIONS. EXISTING DUCT OPENINGS TO BE INFILLED WITH NEW WOOD ROOF DECK TO MATCH EXISTING |

## DEMOLITION GENERAL NOTES:

1. AREAS OF DEMOLITION ARE INDICATED GRAPHICALLY BY DASHED LINES. KEYED NOTES DO NOT IDENTIFY ALL DEMOLITION CONDITIONS. KEYED NOTES ARE INTENDED TO IDENTIFY SELECTIVE DEMOLITION IN SPECIFIC AREAS. EXISTING CONSTRUCTION TO REMAIN IS SHOWN WITH CONTINUOUS LINES.
2. DASHED LINES INDICATE DEMOLITION AREAS FOR ARCHITECTURAL COMPONENTS INCLUDING BUT NOT LIMITED TO WALLS, STUDS, DOORS, DOOR FRAMES, CABINETS, COUNTERS, ETC. CEILINGS, GRID AND TILE SHOULD BE COMPLETELY DEMOLISHED IN AREAS OF DEMOLITION UNLESS OTHERWISE NOTED. EXISTING FLOOR FINISH SHOULD BE COMPLETELY REMOVED IN AREAS OF DEMOLITION UNLESS OTHERWISE NOTED.
3. EXISTING AREAS OF DEMOLITION REFLECT INFORMATION AND CONDITIONS ACCORDING TO AVAILABLE ORIGINAL BUILDING PLANS. EXISTING CONDITIONS AND DIMENSIONS SHALL BE FIELD VERIFIED BY CONTRACTORS AND DISCREPANCIES REPORTED TO THE OWNER AND ARCHITECT.
4. EXISTING WALLS, PARTITIONS, FLOOR LINES, DOORS AND FRAMES THAT REMAIN AND EXISTING FLOOR AND WALL FINISHES THAT ARE SCHEDULED TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION AND CONSTRUCTION.
5. WHERE WALLS OR PARTITIONS ARE INDICATED TO BE REMOVED, REMOVE ENTIRE WALL OR PARTITIONS AS WELL AS DUCTS, PIPING, CONDUITS AND OTHER ELEMENTS IN OR ON THEM WHICH MAY OR MAY NOT BE SPECIFICALLY IDENTIFIED, UNLESS OTHERWISE NOTED. COORDINATE WITH OWNER ALL EQUIPMENT TO BE SALVAGED.
6. SCOPE OF DEMOLITION AND REMOVAL WORK SHALL NOT BE LIMITED BY THESE DRAWINGS BUT SHALL INCLUDE WORK NECESSARY TO FACILITATE NEW CONSTRUCTION.
7. CONTRACTOR TO PROTECT AREAS ADJACENT TO DEMOLITION DURING CONSTRUCTION.
8. ALL DEMO'D EXISTING STONE TO BE SALVAGED FOR RE-USE. SEE SPECIFICATIONS FOR ADDITIONAL INFO.
9. REMOVE EXISTING FLOORING AT ALL ROOMS SCHEDULED TO RECEIVE NEW FLOOR. REF: FINISH PLANS AND SCHEDULE.




2 SECOND FLOOR REFLECTED CEILING PLAN - DEMOLITION
1/8" = 1'-0"

1 FIRST FLOOR REFLECTED CEILING PLAN - DEMOLITION
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
OVERALL DEMO REFLECTED CEILING PLANS

NORTH

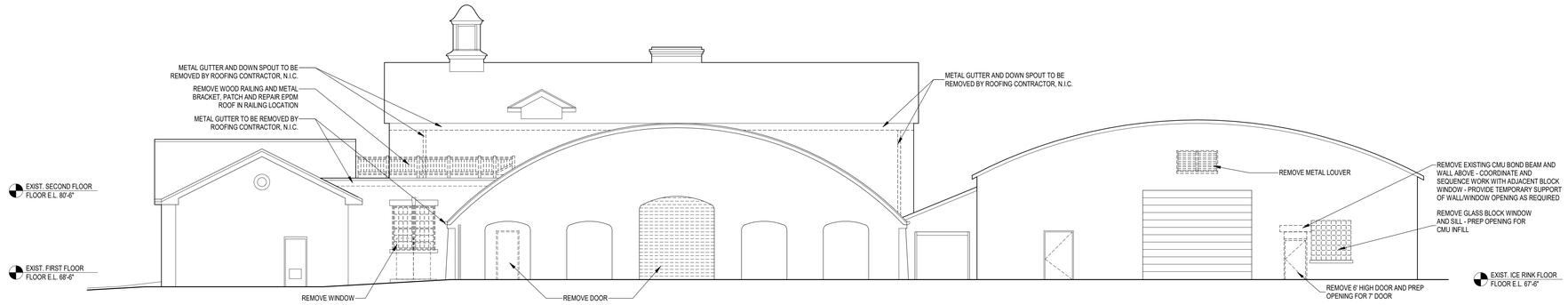
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

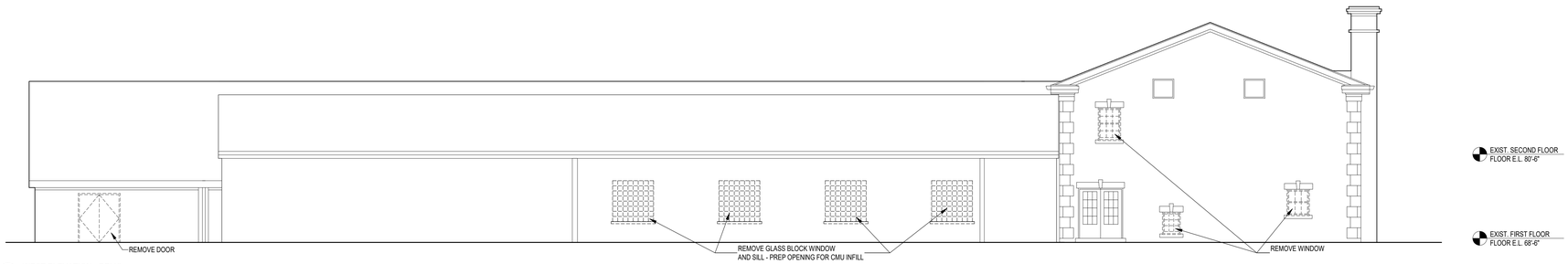
Sheet No.
AD120

1/10/2024 8:55:10 AM

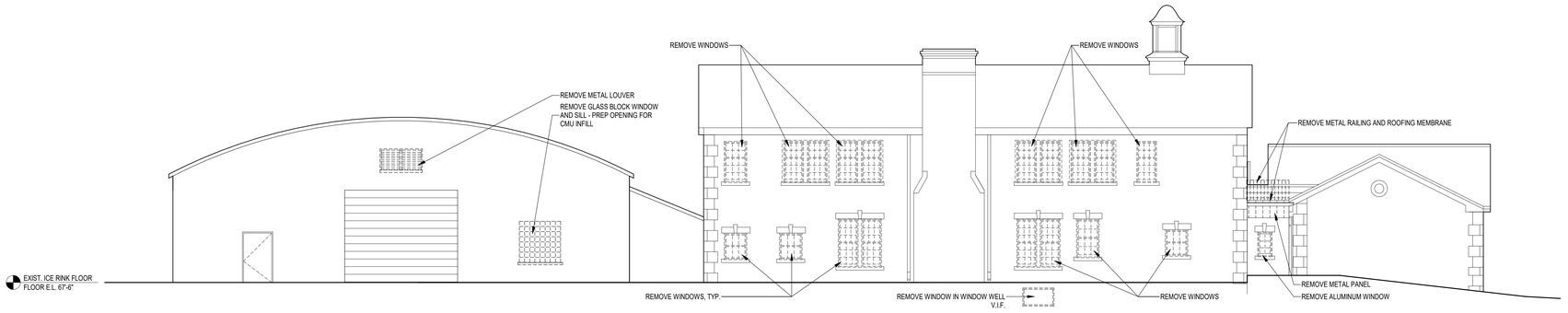
Kahler Slater



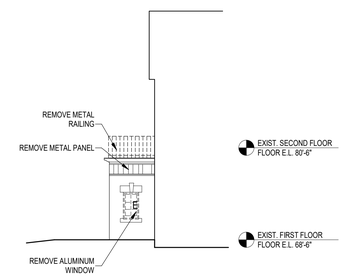

2 NORTH ELEVATION - DEMO
1/8" = 1'-0"



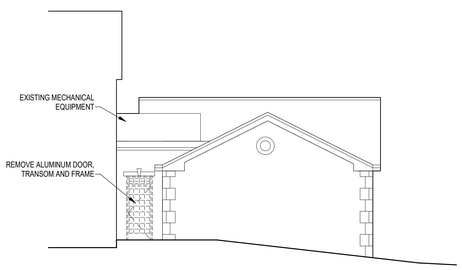

4 WEST ELEVATION - DEMO
1/8" = 1'-0"



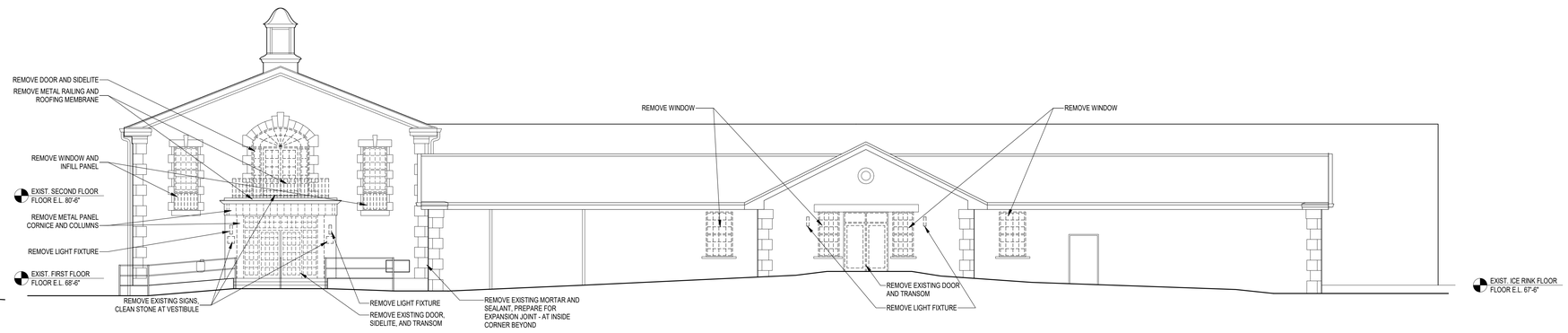

3 SOUTH ELEVATION - DEMO
1/8" = 1'-0"




6 NORTH ELEVATION - A - DEMO
1/8" = 1'-0"




5 SOUTH ELEVATION - A -DEMO
1/8" = 1'-0"




1 EAST ELEVATION - DEMO
1/8" = 1'-0"

## DEMOLITION GENERAL NOTES:

1. AREAS OF DEMOLITION ARE INDICATED GRAPHICALLY BY DASHED LINES. KEYED NOTES DO NOT IDENTIFY ALL DEMOLITION CONDITIONS. KEYED NOTES ARE INTENDED TO IDENTIFY SELECTIVE DEMOLITION IN SPECIFIC AREAS. EXISTING CONSTRUCTION TO REMAIN IS SHOWN WITH CONTINUOUS LINES.
2. DASHED LINES INDICATE DEMOLITION AREAS FOR ARCHITECTURAL COMPONENTS INCLUDING BUT NOT LIMITED TO WALLS, STUDS, DOORS, DOOR FRAMES, CABINETS, COUNTERS, ETC. CEILINGS, GRID AND TILE SHOULD BE COMPLETELY DEMOLISHED IN AREAS OF DEMOLITION UNLESS OTHERWISE NOTED. EXISTING FLOOR FINISH SHOULD BE COMPLETELY REMOVED IN AREAS OF DEMOLITION UNLESS OTHERWISE NOTED.
3. EXISTING AREAS OF DEMOLITION REFLECT INFORMATION AND CONDITIONS ACCORDING TO AVAILABLE ORIGINAL BUILDING PLANS. EXISTING CONDITIONS AND DIMENSIONS SHALL BE FIELD VERIFIED BY CONTRACTORS AND DISCREPANCIES REPORTED TO THE OWNER AND ARCHITECT.
4. EXISTING WALLS, PARTITIONS, FLOOR LINES, DOORS AND FRAMES THAT REMAIN AND EXISTING FLOOR AND WALL FINISHES THAT ARE SCHEDULED TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION AND CONSTRUCTION.
5. WHERE WALLS OR PARTITIONS ARE INDICATED TO BE REMOVED, REMOVE ENTIRE WALL OR PARTITIONS AS WELL AS DUCTS, PIPING, CONDUITS AND OTHER ELEMENTS IN OR ON THEM WHICH MAY OR MAY NOT BE SPECIFICALLY IDENTIFIED, UNLESS OTHERWISE NOTED. COORDINATE WITH OWNER ALL EQUIPMENT TO BE SALVAGED.
6. SCOPE OF DEMOLITION AND REMOVAL WORK SHALL NOT BE LIMITED BY THESE DRAWINGS BUT SHALL INCLUDE WORK NECESSARY TO FACILITATE NEW CONSTRUCTION.
7. CONTRACTOR TO PROTECT AREAS ADJACENT TO DEMOLITION DURING CONSTRUCTION.
8. ALL DEMO'D EXISTING STONE TO BE SALVAGED FOR RE-USE. SEE SPECIFICATIONS FOR ADDITIONAL INFO.
9. REMOVE EXISTING FLOORING AT ALL ROOMS SCHEDULED TO RECEIVE NEW FLOOR. REF: FINISH PLANS AND SCHEDULE.

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
DEMO BUILDING ELEVATIONS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
AD200

1/10/2024 8:05:10 AM

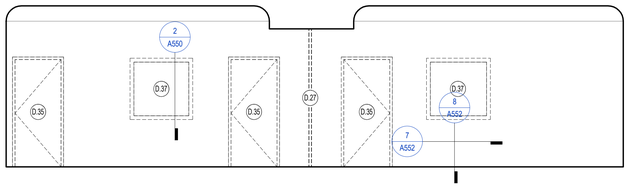
Kahler Slater

## DEMOLITION GENERAL NOTES:

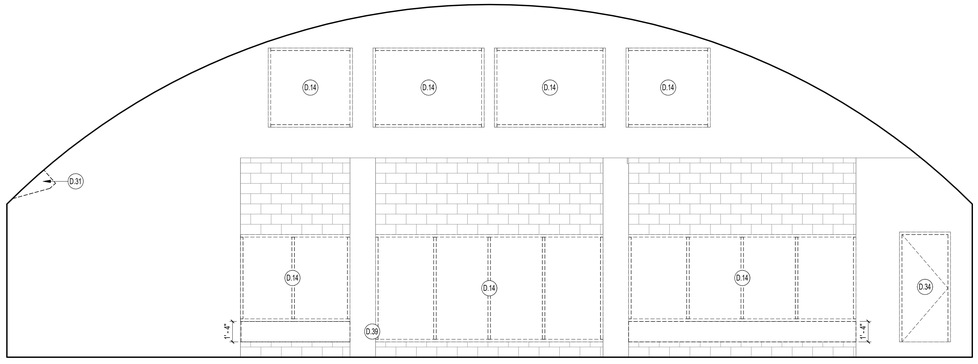
1. AREAS OF DEMOLITION ARE INDICATED GRAPHICALLY BY DASHED LINES. KEYED NOTES DO NOT IDENTIFY ALL DEMOLITION CONDITIONS. KEYED NOTES ARE INTENDED TO IDENTIFY SELECTIVE DEMOLITION IN SPECIFIC AREAS. EXISTING CONSTRUCTION TO REMAIN IS SHOWN WITH CONTINUOUS LINES.
2. DASHED LINES INDICATE DEMOLITION AREAS FOR ARCHITECTURAL COMPONENTS INCLUDING BUT NOT LIMITED TO WALLS, STUDS, DOORS, DOOR FRAMES, CABINETS, COUNTERS, ETC. CEILINGS, GRID AND TILE SHOULD BE COMPLETELY DEMOLISHED IN AREAS OF DEMOLITION UNLESS OTHERWISE NOTED. EXISTING FLOOR FINISH SHOULD BE COMPLETELY REMOVED IN AREAS OF DEMOLITION UNLESS OTHERWISE NOTED.
3. EXISTING AREAS OF DEMOLITION REFLECT INFORMATION AND CONDITIONS ACCORDING TO AVAILABLE ORIGINAL BUILDING PLANS. EXISTING CONDITIONS AND DIMENSIONS SHALL BE FIELD VERIFIED BY CONTRACTORS AND DISCREPANCIES REPORTED TO THE OWNER AND ARCHITECT.
4. EXISTING WALLS, PARTITIONS, FLOOR LINES, DOORS AND FRAMES THAT REMAIN AND EXISTING FLOOR AND WALL FINISHES THAT ARE SCHEDULED TO REMAIN SHALL BE PROTECTED FROM DAMAGE DURING DEMOLITION AND CONSTRUCTION.
5. WHERE WALLS OR PARTITIONS ARE INDICATED TO BE REMOVED, REMOVE ENTIRE WALL OR PARTITIONS AS WELL AS DUCTS, PIPING, CONDUITS AND OTHER ELEMENTS IN OR ON THEM WHICH MAY OR MAY NOT BE SPECIFICALLY IDENTIFIED, UNLESS OTHERWISE NOTED. COORDINATE WITH OWNER ALL EQUIPMENT TO BE SALVAGED.
6. SCOPE OF DEMOLITION AND REMOVAL WORK SHALL NOT BE LIMITED BY THESE DRAWINGS BUT SHALL INCLUDE WORK NECESSARY TO FACILITATE NEW CONSTRUCTION.
7. CONTRACTOR TO PROTECT AREAS ADJACENT TO DEMOLITION DURING CONSTRUCTION.
8. ALL DEMO'D EXISTING STONE TO BE SALVAGED FOR RE-USE. SEE SPECIFICATIONS FOR ADDITIONAL INFO.
9. REMOVE EXISTING FLOORING AT ALL ROOMS SCHEDULED TO RECEIVE NEW FLOOR. REF: FINISH PLANS AND SCHEDULE.

## KEYNOTES - DEMOLITION ELEVATION

| | |
|---|---|
| D.14 | REMOVE EXISTING WINDOW. PREP OPENING FOR NEW WINDOW |
| D.27 | REMOVE EXISTING OPERABLE PARTITION AND TRACK. PATCH AND REPAIR GYP. BD. BULKHEAD |
| D.31 | REMOVE EXISTING SOFFIT, TYP. FOR LENGTH OF TOSA ROOM |
| D.34 | REMOVE EXISTING DOOR. PREP OPENING FOR NEW EXTERIOR FRAME AND DOOR |
| D.35 | REMOVE EXISTING DOOR PANEL(S). PREP EXISTING FRAME AND HARDWARE FOR INSTALL OF NEW DOOR PANEL(S) |
| D.37 | DEMO EXISTING WINDOW FRAME AND TRIM. PREP OPENING FOR NEW FURRING INFILL |
| D.39 | REMOVE EXISTING CMU WALL. PREP FOR NEW FRAMED INFILL WALL |




2 INTERIOR ELEVATION - FIREFLY ROOM EAST DEMO
1/4" = 1'-0"




1 INTERIOR ELEVATION - TOSA ROOM SOUTH DEMO
1/4" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
DEMO INTERIOR ELEVATIONS & DETAILS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
AD250

1/10/2024 8:05:11 AM

## PARTITION TYPES

| PLAN MARK | SUBSTRATE MATERIAL | SUBSTRATE WIDTH | FINISH SIDE 1 MATERIAL | FINISH SIDE 1 THICKNESS | FINISH SIDE 2 MATERIAL | FINISH SIDE 2 THICKNESS | TOTAL THICKNESS | PART SECT | ACOUSTIC INSULATION | STC | FIRE RATING | UL | PARTITION SPECIFIC KEYED NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1' - 3" | | | | | | |
| A | | | | | | | | | | | | | |
| 0AC | MS | 2 1/2" | GYP BD | 5/8" | | | 3 1/8" | A | | | | | |
| 0AD | MS | 3 5/8" | GYP BD | 5/8" | | | 4 1/4" | A | | | | | |
| B | | | | | | | | | | | | | |
| 0BC | MS | 2 1/2" | GYP BD | 5/8" | | | 3 1/8" | B | | | | | |
| 0BD | MS | 3 5/8" | GYP BD | 5/8" | | | 4 1/4" | B | | | | | |
| C | | | | | | | | | | | | | |
| 0CC | MS | 2 1/2" | GYP BD | 5/8" | | | 3 3/4" | A | SAB | | | | |
| 0CD | MS | 3 5/8" | GYP BD | 5/8" | | | 4 7/8" | A | SAB | | | | |
| D | | | | | | | | | | | | | |
| 0DC | MS | 2 1/2" | GYP BD | 5/8" | | | 3 1/8" | B | SAB | | | | |
| 0DG | MS | 6" | GYP BD | 5/8" | | | 6 5/8" | B | SAB | | | | |
| E | | | | | | | | | | | | | |
| 0ED | MS | 3 5/8" | GYP BD | 5/8" | GYP BD | 5/8" | 4 7/8" | A | | 45-49 | | | |

## GENERAL NOTES

A. REFER TO FLOOR PLANS FOR PARTITION LOCATIONS.

B. ALL PARTITIONS RUN TO DECK ABOVE ("TYPICAL PARTITION SECTION" TYPE) UNLESS NOTED OTHERWISE BY SUBSCRIPT IN PLAN MARK. SEE PARTITION SECTION TYPES BELOW.

C. AT THE INTERSECTION OF PARTITIONS OF DISSIMILAR RATINGS, THE PARTITION OF THE HIGHER RATING SHALL CONTINUE THROUGH UNINTERRUPTED AND SHALL TAKE PRECEDENCE OVER THE LOWER PARTITION RATING.

D. SEE DRAWINGS FOR SPECIFIC PARTITION DETAILS.

E. PROVIDE ACOUSTICAL JOINT SEALANTS AT PENETRATIONS.

F. PROVIDE BOND BEAM AT TOP OF ALL CMU WALLS, UNO.

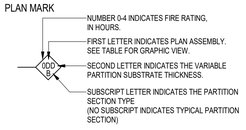
## PLAN ASSEMBLIES

| PLAN SYMBOL | PLAN ASSEMBLY | PLAN SYMBOL | PLAN ASSEMBLY |
|---|---|---|---|
| A | A | L | L |
| B | B | M | M |
| C | C | P | P |
| D | D | R | R |
| E | E | S | S |
| F | F | T | T |
| G | G | U | U |

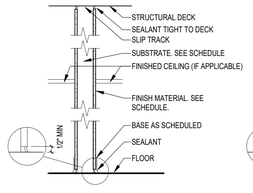
## VARIABLE PARTITION SUBSTRATE THICKNESS (INCHES)

| | LETTER | THICKNESS | MS | CMU | WS | OTHER |
|---|---|---|---|---|---|---|
| METAL STUD & CMU | A | 7/8 | X | | | |
| | B | 1 5/8" | X | | | |
| | C | 2 1/2" | X | | | |
| | D | 3 5/8" | X | X | | |
| | E | 4" | X | | | |
| | F | 5 5/8" | | X | | |
| | G | 6" | X | | | |
| | H | 7 5/8" | | X | | |
| | J | 8" | X | | | |
| | K | 9 5/8" | | X | | |
| | L | 11 5/8" | | X | | |
| | M | 6 3/4" | X | | | (1) 3 5/8" (1) 2 1/2" |
| WOOD STUD | N | 1 1/2" | | | X | |
| | P | 3 1/2" | | | X | |
| | Q | 5 1/2" | | | X | |
| | R | 7 1/4" | | | X | |
| PROJECT SPECIFIC | S | 10" | X | | | |
| | T | | | | | |
| | U | | | | | |
| | V | | | | | |
| | W | | | | | |
| | X | | | | | |
| | Y | | | | | |
| | Z | | | | | |

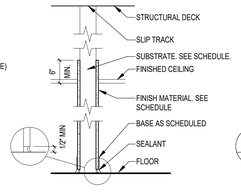
PLAN MARK



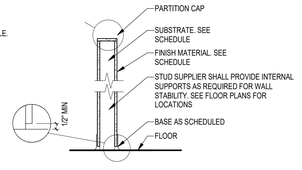

## PARTITION SECTION TYPES



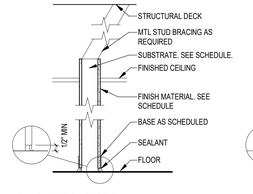

TYPICAL PARTITION SECTION



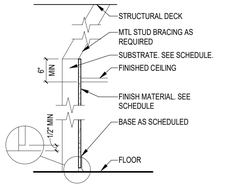

A PARTITION SECTION



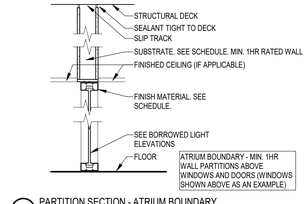

B PARTITION SECTION




C PARTITION SECTION




D PARTITION SECTION




E PARTITION SECTION - ATRIUM BOUNDARY

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
PARTITION SCHEDULE AND LEGEND

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A020

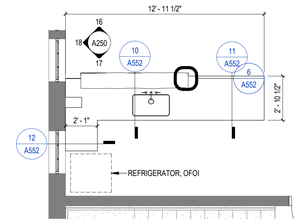
Kahler Slater

## KEYNOTES - FLOOR PLAN

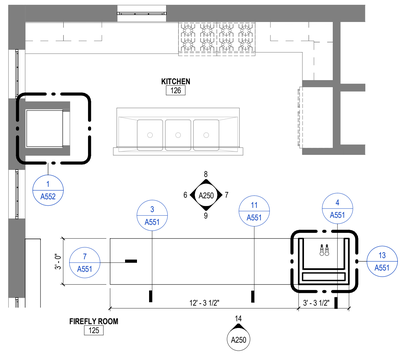
| | |
|---|---|
| 118 | NEW FRP DOOR - SEE DOOR SCHEDULE |
| 119 | NEW ALUMINUM CLAD WOOD DOOR AND SIDELITES |
| 120 | NEW PRE-FINISHED METAL RAILING |
| 121 | NEW ALUMINUM CLAD WOOD WINDOW AND FIBER CEMENT BOARD INFILL PANEL TO MATCH HISTORIC |
| 123 | NEW COUNTERTOP TO REPLACE EXISTING AS-IS. REMOVE AND REPLACE WINDOW ONCE COUNTERTOP IS INSTALLED. PL-02. |
| 128 | NEW CMU INFILL AT EXISTING BLOCK |
| 132 | ALL GYPSUM BOARD IN TOSA ROOM 106 TO BE IMPACT-RESISTANT |

## GENERAL NOTES:

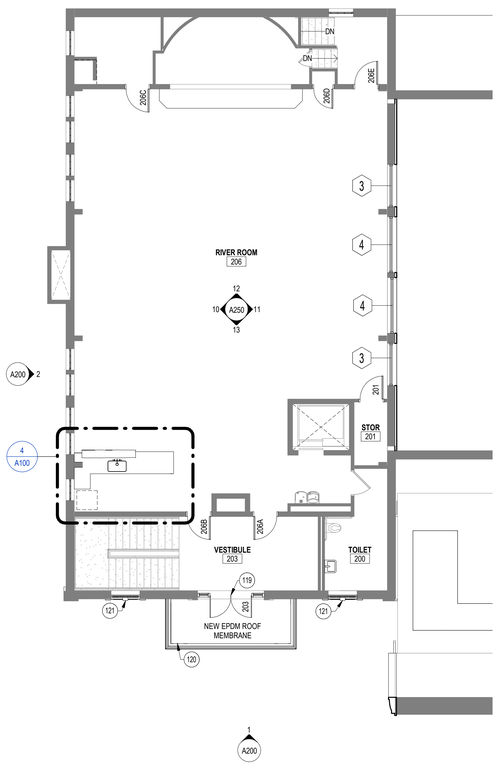
1. DO NOT SCALE THE DRAWINGS. VERIFY ALL CONDITIONS ON-SITE BEFORE PROCEEDING WITH WORK.
2. ANY CONFLICT OR DISCREPANCY BETWEEN INFORMATON ON DRAWINGS AND ACTUAL FIELD CONDITIONS SHALL BE BROUGHT TO ARCHITECT'S ATTENTION FOR RESOLUTION PRIOR TO COMMENCING WORK.
3. PARTITION DIMENSIONS INDICATED ARE TO FINISHED FACE OF WALL.
4. PAINT ALL EXISTING EXTERIOR WOOD TRIM.
5. REFER TO A650 FOR INTERIOR WINDOW TYPES.



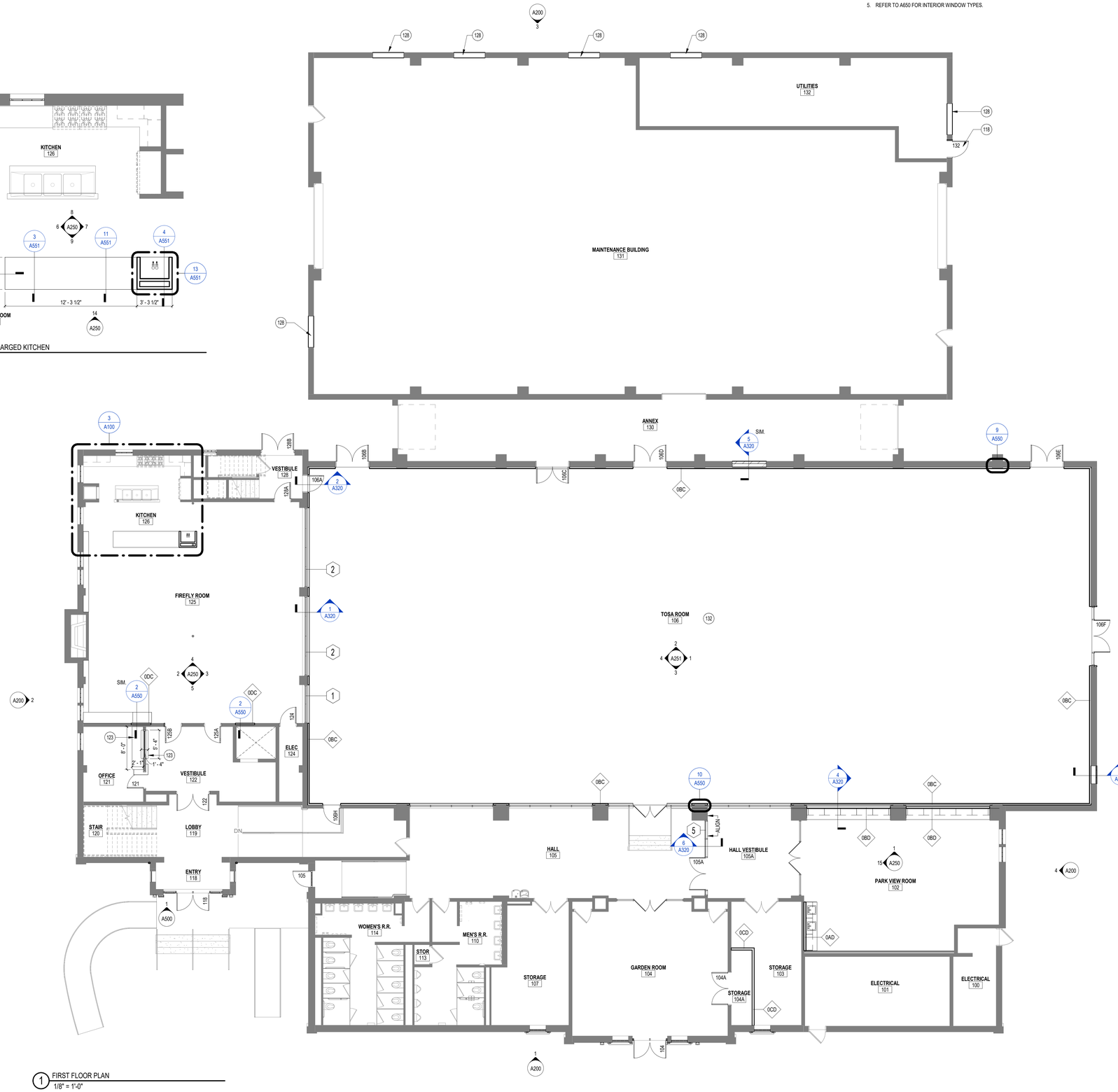

4 SECOND FLOOR PLAN - ENLARGED KITCHEN
1/4" = 1'-0"




3 FIRST FLOOR PLAN - ENLARGED KITCHEN
1/4" = 1'-0"




2 SECOND FLOOR PLAN
1/8" = 1'-0"




1 FIRST FLOOR PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
OVERALL FLOOR PLANS

NORTH

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A100

Kahler Slater

## RCP LEGEND

SUSPENDED ACOUSTIC TILE CEILING SYSTEM

LIGHT FIXTURES - SEE ELECTRICAL DRAWINGS

OS

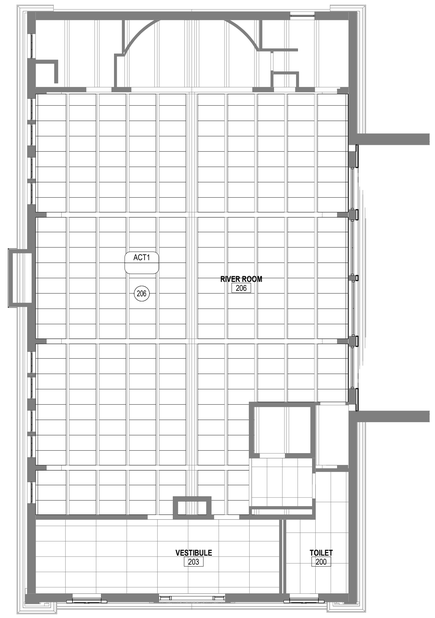
OCCUPCANY SENSOR - ELAN LIGHTING: ACUITY CONTROLS SENSOR SWITCH MODEL CM PDT OR EQUAL - SEE NOTE 5

## CEILING PLAN GENERAL NOTES

1. CEILING HEIGHTS ARE 9'-0" ABOVE CURRENT FLOOR PLAN ELEVATION UNLESS NOTED OTHERWISE ON THE DRAWINGS.
2. BALANCE OR CENTER CEILING GRIDS WITHIN ROOMS OR SPACES EACH TO MINIMIZE TILES CUT TO LESS THAN 1'-0". TILE WIDTHS LESS THAN 4" ARE NOT PERMITTED. CUT DOWN LARGER PANELS AS REQUIRED.
3. PROVIDE CUT-OUTS AND OPENINGS FOR ITEMS WHICH PENETRATE THROUGH CEILINGS SYSTEMS (INCLUDING SPECIAL EQUIPMENT HANGERS AND DEVICES, CONDUIT, PIPING, ELECTRICAL REQUIREMENTS, ETC.).
4. CENTER ALL LIGHTS, SPEAKERS, SPRINKLERS, HVAC GRILLES, SMOKE DETECTORS, ETC. IN CENTER OF CEILING TILES UNO.
5. PATCH AND REPAIR AROUND REPLACEMENT LIGHTING FIXTURES IN EXISTING GYPSUM BOARD CEILINGS.
6. ACCESS PANELS SHOULD BE PAINTED TO MATCH CEILING.

## KEYNOTES - REFLECTED CEILING PLAN

| | |
|---|---|
| 206 | CEILING HEIGHT VARIES. REPLACE EXISTING CEILING PANELS. SALVAGE EXISTING GRID AND TRIM AND REPAINT FOR INSTALLATION WITH NEW CEILING PANELS |




2 SECOND FLOOR REFLECTED CEILING PLAN
1/8" = 1'-0"

1 FIRST FLOOR REFLECTED CEILING PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
OVERALL REFLECTED CEILING PLANS

NORTH

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A120

Kahler Slater

## INTERIOR FINISH SYMBOL LEGEND

| | |
|---|---|
| FLOOR FINISH<br>CEILING FINISH<br>WALL FINISH | ROOM FINISH TAG |
| XXX XXX | FLOOR FINISH TRANSITION |
| | FLOOR FINISH GRAIN / INSTALLATION DIRECTION |

## ROOM FINISH SCHEDULE

| ROOM NAME | FLOOR | BASE | WALL | | | | MISC FINISH | CEILING | REMARKS | REV |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | NORTH | EAST | SOUTH | WEST | | | | |
| PARK VIEW ROOM | LVT-01 | RB-01 | SEE ELEV | PNT-02 | PNT-02 | SEE ELEV | | - | | |
| STORAGE | LVT-01 | - | - | - | - | PNT-02 | | - | | |
| GARDEN ROOM | LVT-01 | RB-01 | PNT-02 | PNT-02 | PNT-02 | PNT-02 | | PNT-01 | | |
| STORAGE | LVT-01 | RB-01 | PNT-02 | PNT-02 | PNT-02 | PNT-02 | | - | | |
| HALL VESTIBULE | LVT-01 | RB-01 | - | - | - | - | | - | | |
| TOSA ROOM | SC | - | PNT-02 | PNT-02 | PNT-02 | PNT-02 | | STN-01 | | |
| OFFICE | CPT-01 | RB-01 | - | - | - | - | | - | | |
| FIREFLY ROOM | LVT-01 | | SEE ELEV | SEE ELEV | SEE ELEV | SEE ELEV | | PNT-01 | | |
| KITCHEN | LVT-01/EXIST | | PNT-03 | | PNT-03 | PNT-03 | | ACT-02 | | |
| STOR | TL-1 | PCTB-1 | PNT-02 | PNT-02 | PNT-02 | CTW-1 | | ACT-1 | | |
| RIVER ROOM | - | - | PNT-02 | PNT-02 | PNT-02 | PNT-02 | | ACT-01 | | |

## MATERIAL KEY

**FLOORS:**
- CPT-01: J&J, PATTERN: ONE GOOD TURN, 7075/3331 TURN IT UP (CPT TILE 2'X2')
- LVT-01: J&J CLASSICS II 1003 HEIRLOOM (20 MIL, 9"X 48" PLANKS)
- RB-01: TARKETT, 4", 20 CHARCOAL WG
- RB-02: TARKETT, 6", STYLE A - STRAIGHT, 27 MIST (ARCHITECT TO SELECT FROM MANUF. STANDARD COLOR RANGE)

**CASEWORK:**
- SS-01: LG HI MACS G101 CRYSTAL BEIGE
- PL-01: WILSONART PASADENA OAK 7986-38 (WOOD LOOK LAMINATE)
- PL-02: WILSONART BEIGE PAMPAS 4170-60 (SPECKLED WHITE LAMINATE)

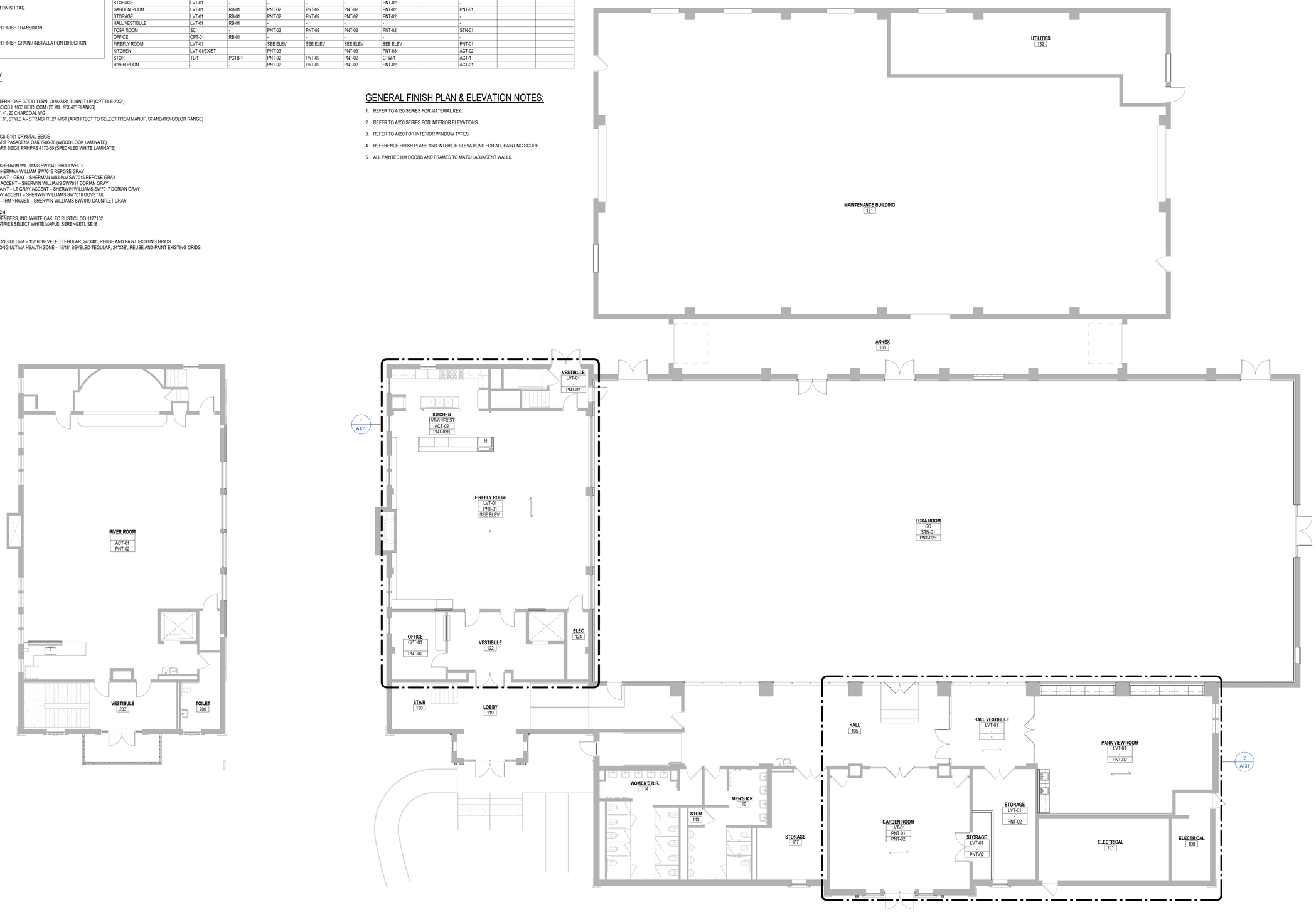
**PAINTS:**
- PNT-01: WHITE – SHERWIN WILLIAMS SW7042 SHOJI WHITE
- PNT-02: GRAY – SHERMAN WILLIAM SW7015 REPOSE GRAY
- PNT-02B: EPOXY PAINT – GRAY – SHERMAN WILLIAM SW7015 REPOSE GRAY
- PNT-03: LT GRAY ACCENT – SHERWIN WILLIAMS SW7017 DORIAN GRAY
- PNT-03B: EPOXY PAINT – LT GRAY ACCENT – SHERWIN WILLIAMS SW7017 DORIAN GRAY
- PNT-04: MED GRAY ACCENT – SHERWIN WILLIAMS SW7018 DOVETAIL
- PNT-05: DK GRAY – HM FRAMES – SHERWIN WILLIAMS SW7019 GAUNTLET GRAY

**DOORS – WOOD STAIN MATCH:**
- WV-01: DOOGE VENEERS, INC. WHITE OAK, FC RUSTIC LOG 1177162
- WV-02: VT INDUSTRIES SELECT WHITE MAPLE, SERENGETI, SE18

**CEILING:**
- ACT-01: ARMSTRONG ULTIMA – 15/16" BEVELED TEGULAR, 24"X48", REUSE AND PAINT EXISTING GRIDS
- ACT-02: ARMSTRONG ULTIMA HEALTH ZONE – 15/16" BEVELED TEGULAR, 24"X48", REUSE AND PAINT EXISTING GRIDS

## GENERAL FINISH PLAN & ELEVATION NOTES:

1. REFER TO A130 SERIES FOR MATERIAL KEY.
2. REFER TO A250 SERIES FOR INTERIOR ELEVATIONS.
3. REFER TO A650 FOR INTERIOR WINDOW TYPES.
4. REFERENCE FINISH PLANS AND INTERIOR ELEVATIONS FOR ALL PAINTING SCOPE.
5. ALL PAINTED HM DOORS AND FRAMES TO MATCH ADJACENT WALLS.




2 SECOND FLOOR FINISH PLAN
1/8" = 1'-0"

1 FIRST FLOOR FINISH PLAN OVERALL
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
OVERALL FINISH PLANS

NORTH

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A130

1/10/2024 4:54:54 AM

Kahler Slater

## INTERIOR FINISH SYMBOL LEGEND

| | |
|---|---|
| FLOOR FINISH<br>CEILING FINISH<br>WALL FINISH | ROOM FINISH TAG |
| XXX XXX | FLOOR FINISH TRANSITION |
| | FLOOR FINISH GRAIN / INSTALLATION DIRECTION |

## ROOM FINISH SCHEDULE

| ROOM NAME | FLOOR | BASE | WALL | | | | MISC FINISH | CEILING | REMARKS | REV |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | NORTH | EAST | SOUTH | WEST | | | | |
| PARK VIEW ROOM | LVT-01 | RB-01 | SEE ELEV | PNT-02 | PNT-02 | SEE ELEV | | - | | |
| STORAGE | LVT-01 | - | - | - | - | PNT-02 | | - | | |
| GARDEN ROOM | LVT-01 | RB-01 | PNT-02 | PNT-02 | PNT-02 | PNT-02 | | PNT-01 | | |
| STORAGE | LVT-01 | RB-01 | PNT-02 | PNT-02 | PNT-02 | PNT-02 | | - | | |
| HALL VESTIBULE | LVT-01 | RB-01 | - | - | - | - | | - | | |
| TOSA ROOM | SC | - | PNT-02 | PNT-02 | PNT-02 | PNT-02 | | STN-01 | | |
| OFFICE | CPT-01 | RB-01 | - | - | - | - | | - | | |
| FIREFLY ROOM | LVT-01 | | SEE ELEV | SEE ELEV | SEE ELEV | SEE ELEV | | PNT-01 | | |
| KITCHEN | LVT-01/EXIST | | PNT-03 | | PNT-03 | PNT-03 | | ACT-02 | | |
| STOR | TL-1 | PCTB-1 | PNT-02 | PNT-02 | PNT-02 | CTW-1 | | ACT-1 | | |
| RIVER ROOM | - | - | PNT-02 | PNT-02 | PNT-02 | PNT-02 | | ACT-01 | | |

## MATERIAL KEY

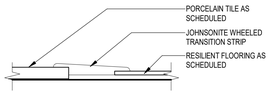
**FLOORS:**
- CPT-01: J&J, PATTERN: ONE GOOD TURN, 7075/3331 TURN IT UP (CPT TILE 2'X2')
- LVT-01: J&J CLASSICS II 1003 HEIRLOOM (20 MIL, 9"X 48" PLANKS)
- RB-01: TARKETT, 4", 20 CHARCOAL WG
- RB-02: TARKETT, 6", STYLE A - STRAIGHT, 27 MIST (ARCHITECT TO SELECT FROM MANUF. STANDARD COLOR RANGE)

**CASEWORK:**
- SS-01: LG HI MACS G101 CRYSTAL BEIGE
- PL-01: WILSONART PASADENA OAK 7986-38 (WOOD LOOK LAMINATE)
- PL-02: WILSONART BEIGE PAMPAS 4170-60 (SPECKLED WHITE LAMINATE)

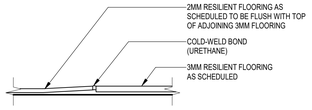
**PAINTS:**
- PNT-01: WHITE – SHERWIN WILLIAMS SW7042 SHOJI WHITE
- PNT-02: GRAY – SHERMAN WILLIAM SW7015 REPOSE GRAY
- PNT-02B: EPOXY PAINT – GRAY – SHERMAN WILLIAM SW7015 REPOSE GRAY
- PNT-03: LT GRAY ACCENT – SHERWIN WILLIAMS SW7017 DORIAN GRAY
- PNT-03B: EPOXY PAINT – LT GRAY ACCENT – SHERWIN WILLIAMS SW7017 DORIAN GRAY
- PNT-04: MED GRAY ACCENT – SHERWIN WILLIAMS SW7018 DOVETAIL
- PNT-05: DK GRAY – HM FRAMES – SHERWIN WILLIAMS SW7019 GAUNTLET GRAY

**DOORS – WOOD STAIN MATCH:**
- WV-01: DOOGE VENEERS, INC. WHITE OAK, FC RUSTIC LOG 1177162
- WV-02: VT INDUSTRIES SELECT WHITE MAPLE, SERENGETI, SE18

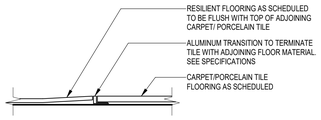
**CEILING:**
- ACT-01: ARMSTRONG ULTIMA – 15/16" BEVELED TEGULAR, 24"X48", REUSE AND PAINT EXISTING GRIDS
- ACT-02: ARMSTRONG ULTIMA HEALTH ZONE – 15/16" BEVELED TEGULAR, 24"X48", REUSE AND PAINT EXISTING GRIDS



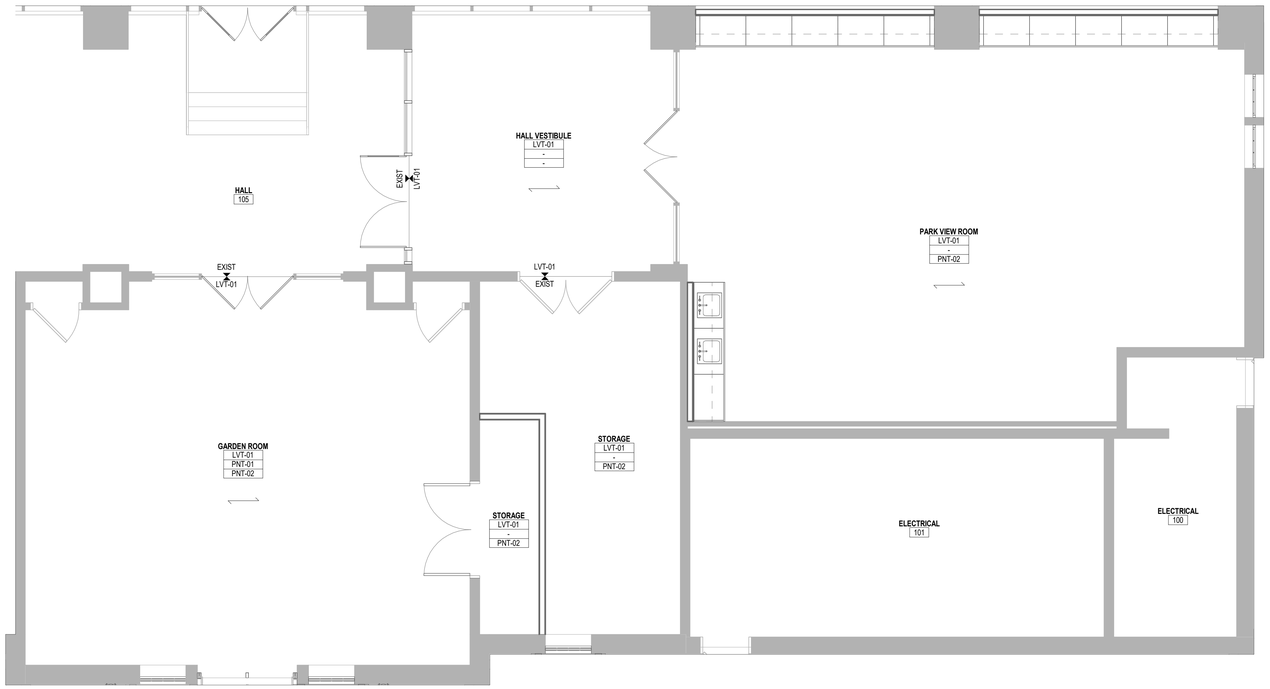

3 TRANSITION DETAIL - TILE TO RESILIENT
6" = 1'-0"



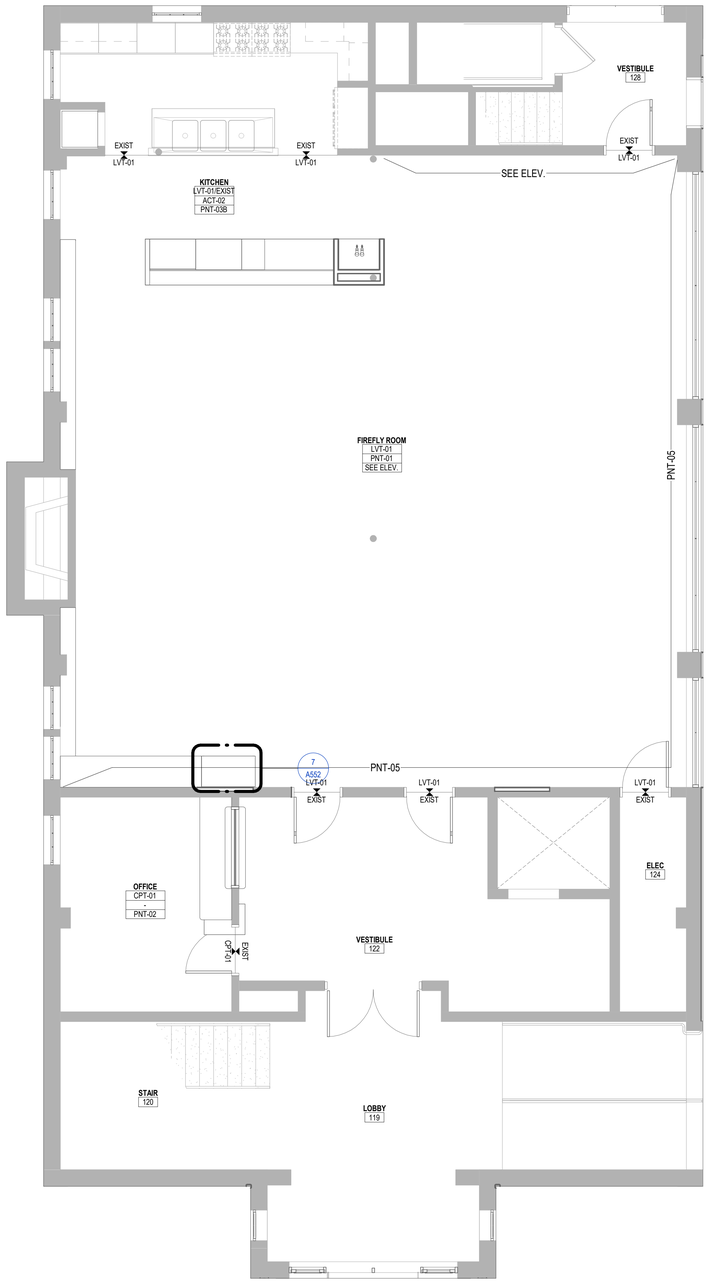

4 TRANSITION DETAIL - 2MM RESILIENT TO 3MM RESILIENT
6" = 1'-0"




5 TRANSITION DETAIL - CARPET/TILE TO RESILIENT
6" = 1'-0"




2 FIRST FLOOR FINISH PLAN AREA B
1/4" = 1'-0"




1 FIRST FLOOR FINISH PLAN AREA A
1/4" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
ENLARGED FINISH PLANS & DETAILS

NORTH

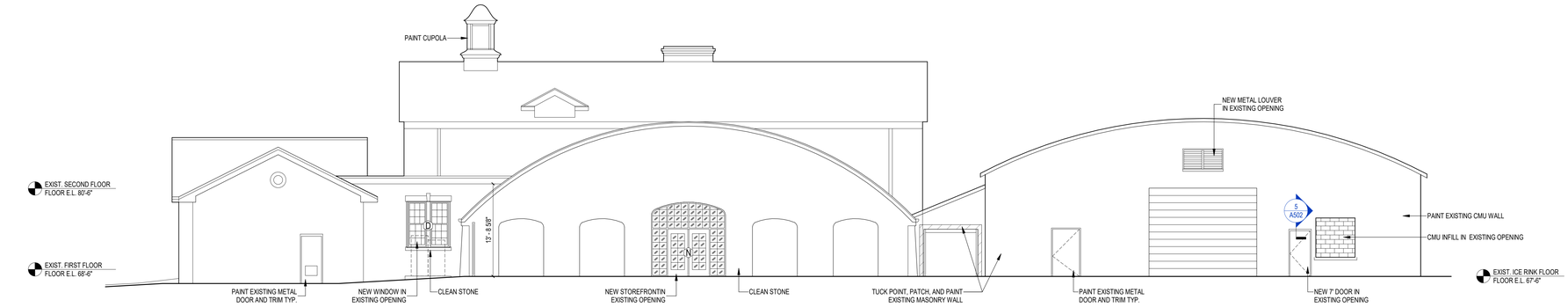
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

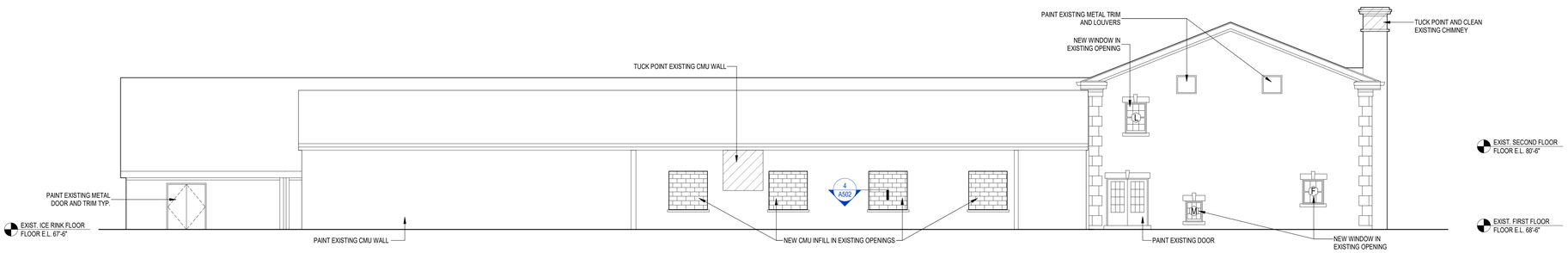
Sheet No.
A131

1/10/2024 8:56:55 AM

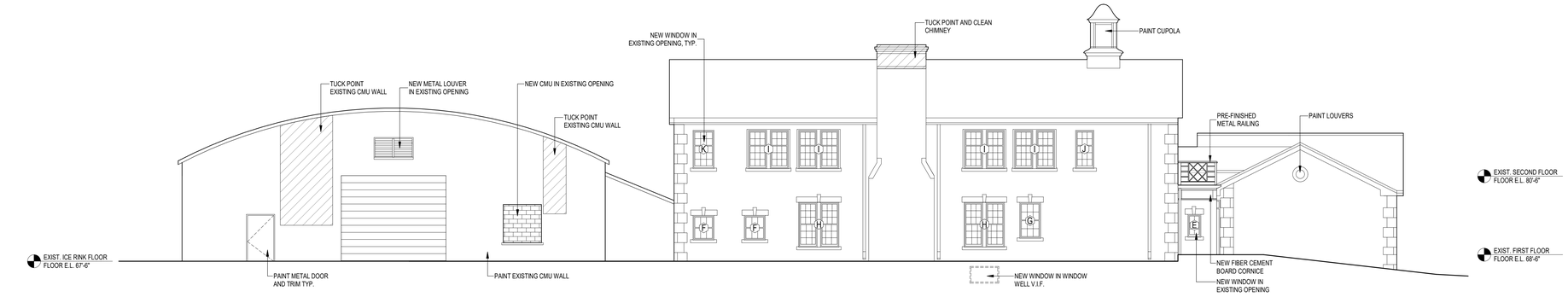
Kahler Slater



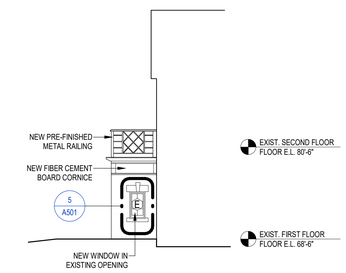

4 NORTH ELEVATION
1/8" = 1'-0"



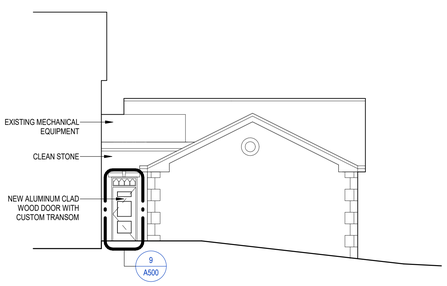

3 WEST ELEVATION
1/8" = 1'-0"



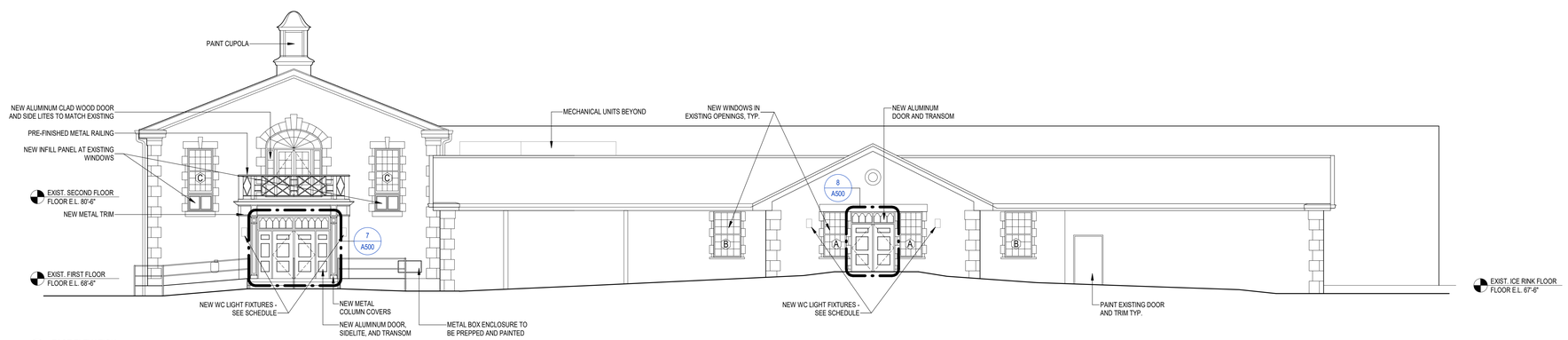

2 SOUTH ELEVATION
1/8" = 1'-0"




6 NORTH ELEVATION - A
1/8" = 1'-0"




5 SOUTH ELEVATION - A
1/8" = 1'-0"




1 EAST ELEVATION
1/8" = 1'-0"

## EXTERIOR ELEVATION NOTES:

1. DO NOT SCALE THE DRAWINGS. VERIFY ALL CONDITIONS ON-SITE BEFORE PROCEEDING WITH WORK.
2. ANY CONFLICT OR DISCREPANCY BETWEEN INFORMATION ON DRAWINGS AND ACTUAL FIELD CONDITIONS SHALL BE BROUGHT TO ARCHITECT'S ATTENTION FOR RESOLUTION PRIOR TO COMMENCING WORK.
3. PATCH, PAINT, AND REPAIR EXTERIOR WOOD TRIM
4. PAINT ALL METAL TRIM
5. PAINT ALL EXISTING DOORS, MUNTINS, AND ASSOCIATED TRIM
6. TUCK POINT EXISTING STONE AS REQUIRED
7. CLEAN STONE ON BUILDING AS NEEDED
8. EXISTING AND FUTURE BALCONY IS UNOCCUPIED. THE RAILING THAT IS BEING INSTALLED FOR STRUCTURAL PERFORMANCE. THE RAIL IS DECORATIVE AND HAS LARGER OPENINGS BUT SINCE IT IS NOT OCCUPIED THIS IS NOT A CODE CONCERN
9. REFER TO A501 FOR EXTERIOR WINDOW TYPES

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
BUILDING ELEVATIONS

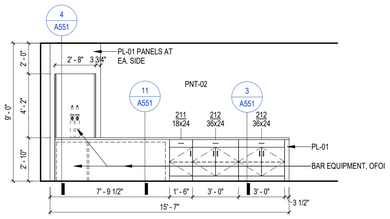
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

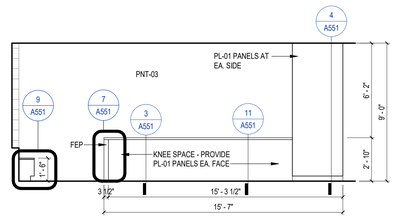
Sheet No.
A200

1/10/2024 8:04:06 AM

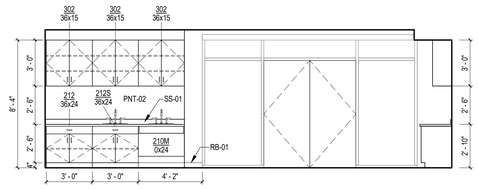
Kahler Slater



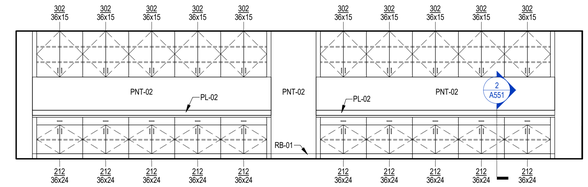

9 INTERIOR ELEVATION - EAST ISLAND
1/4" = 1'-0"



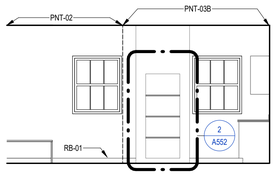

14 INTERIOR ELEVATION - WEST ISLAND
1/4" = 1'-0"



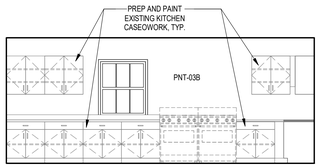

15 INTERIOR ELEVATION - PARK VIEW ROOM SOUTH
1/4" = 1'-0"



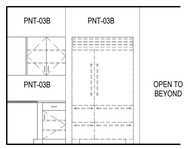

1 INTERIOR ELEVATION - PARK VIEW ROOM WEST
1/4" = 1'-0"




6 INTERIOR ELEVATION - SOUTH KITCHEN
1/4" = 1'-0"



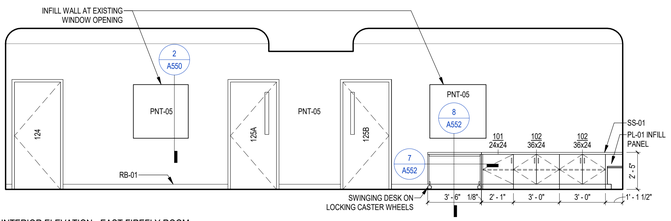

8 INTERIOR ELEVATION - WEST KITCHEN
1/4" = 1'-0"



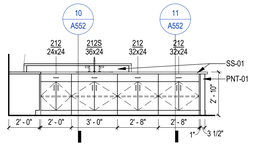

7 INTERIOR ELEVATION - NORTH KITCHEN
1/4" = 1'-0"

## GENERAL FINISH PLAN & ELEVATION NOTES:

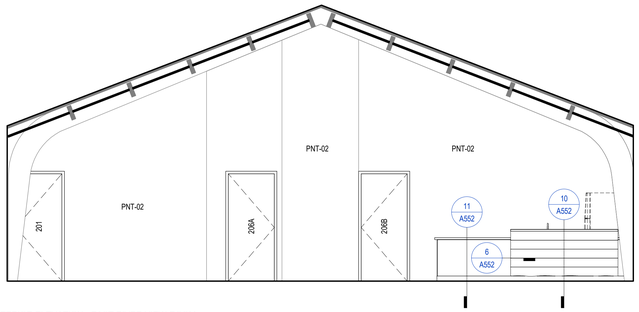
1. REFER TO A130 SERIES FOR MATERIAL KEY.
2. REFER TO A250 SERIES FOR INTERIOR ELEVATIONS.
3. REFER TO A650 FOR INTERIOR WINDOW TYPES.
4. REFERENCE FINISH PLANS AND INTERIOR ELEVATIONS FOR ALL PAINTING SCOPE.
5. ALL PAINTED HM DOORS AND FRAMES TO MATCH ADJACENT WALLS.



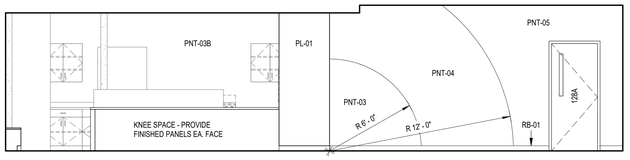

5 INTERIOR ELEVATION - EAST FIREFLY ROOM
1/4" = 1'-0"



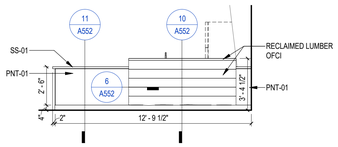

16 INTERIOR ELEVATION - WEST RIVER VIEW ROOM KITCHENETTE
1/4" = 1'-0"



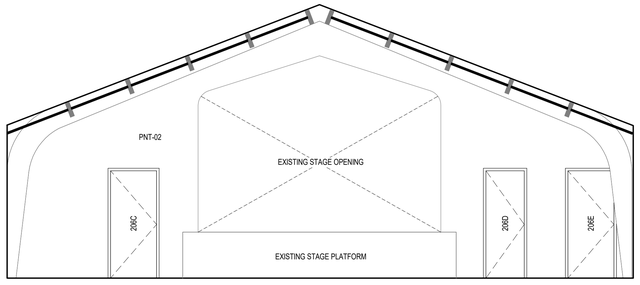

13 INTERIOR ELEVATION - EAST RIVER VIEW ROOM
1/4" = 1'-0"



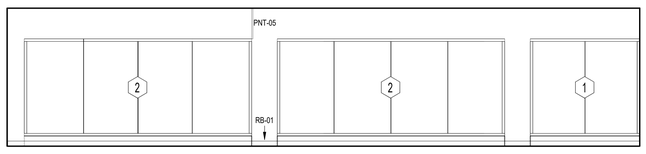

4 INTERIOR ELEVATION - WEST FIREFLY ROOM
1/4" = 1'-0"



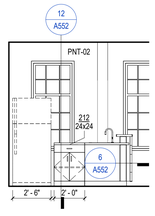

17 INTERIOR ELEVATION - EAST RIVER VIEW ROOM KITCHENETTE
1/4" = 1'-0"



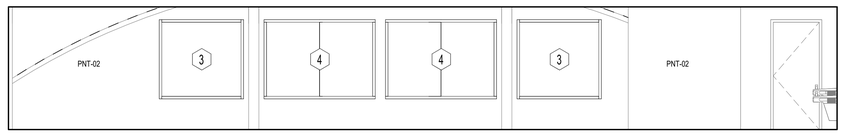

12 INTERIOR ELEVATION - WEST RIVER VIEW ROOM
1/4" = 1'-0"



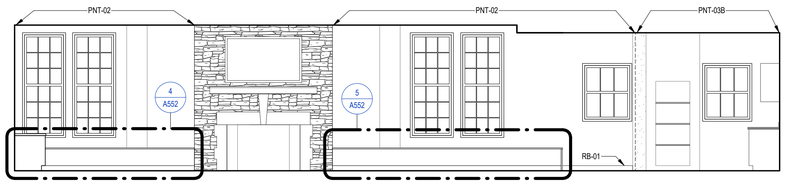

3 INTERIOR ELEVATION - NORTH FIREFLY ROOM
1/4" = 1'-0"



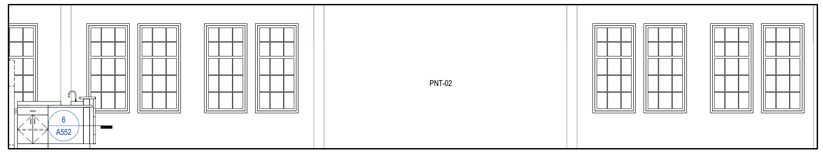

18 INTERIOR ELEVATION - SOUTH RIVER VIEW ROOM KITCHENETTE
1/4" = 1'-0"




11 INTERIOR ELEVATION - NORTH RIVER VIEW ROOM
1/4" = 1'-0"




2 INTERIOR ELEVATION - SOUTH FIREFLY ROOM
1/4" = 1'-0"




10 INTERIOR ELEVATION - SOUTH RIVER VIEW ROOM
1/4" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
INTERIOR ELEVATIONS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

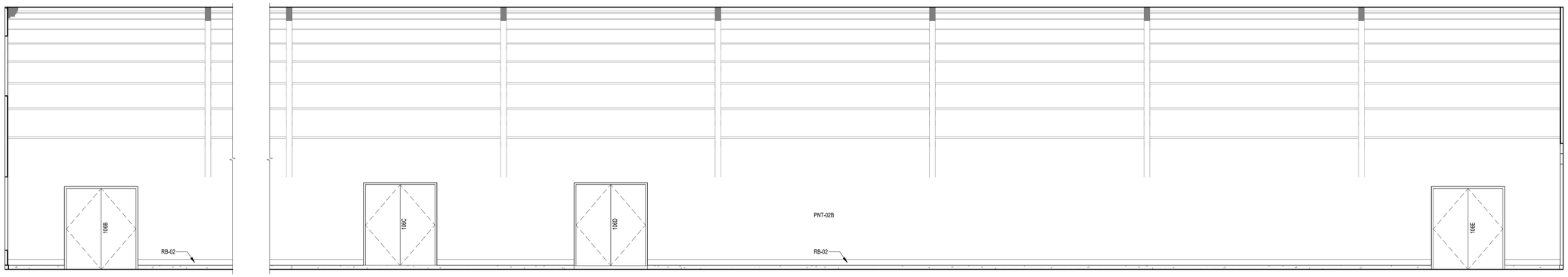
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A250

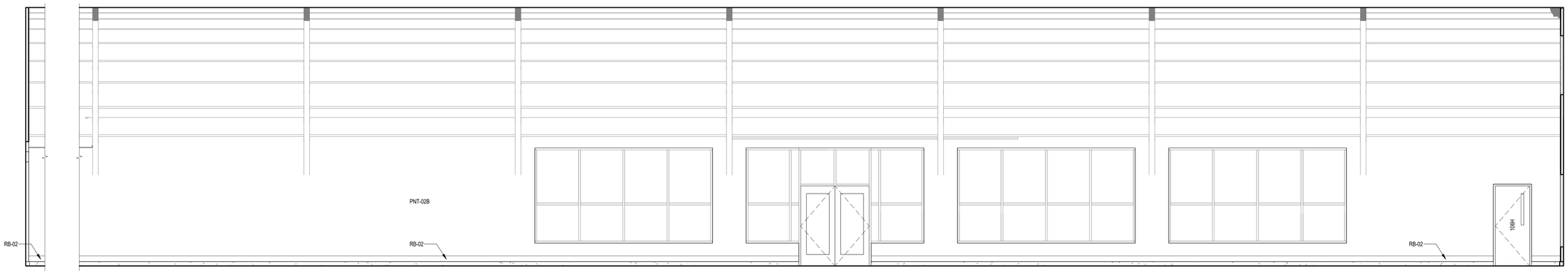
Kahler Slater

## GENERAL FINISH PLAN & ELEVATION NOTES:

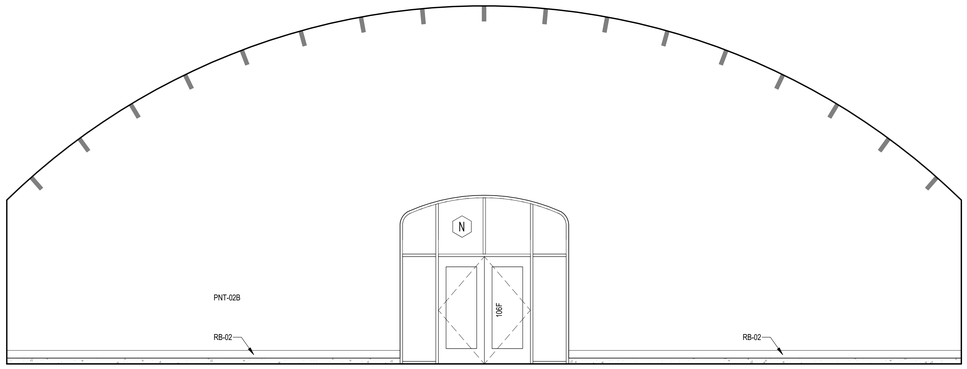
1. REFER TO A130 SERIES FOR MATERIAL KEY.
2. REFER TO A250 SERIES FOR INTERIOR ELEVATIONS.
3. REFER TO A650 FOR INTERIOR WINDOW TYPES.
4. REFERENCE FINISH PLANS AND INTERIOR ELEVATIONS FOR ALL PAINTING SCOPE.
5. ALL PAINTED HM DOORS AND FRAMES TO MATCH ADJACENT WALLS.



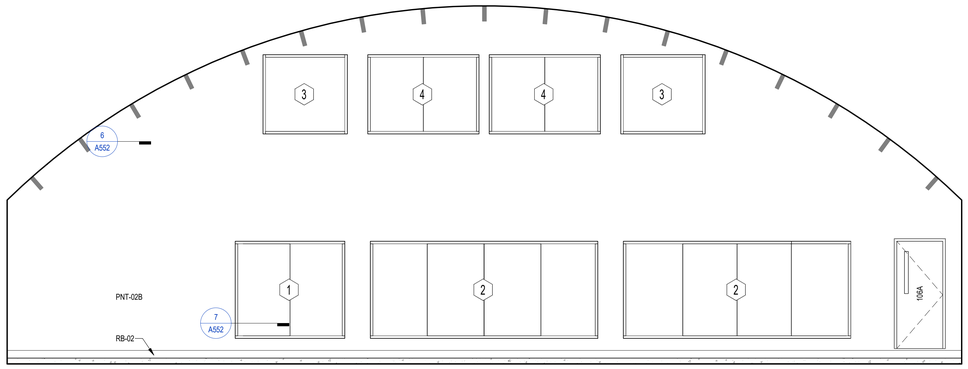

2 INTERIOR ELEVATION - WEST TOSA ROOM
1/4" = 1'-0"




3 INTERIOR ELEVATION - EAST TOSA ROOM
1/4" = 1'-0"




1 INTERIOR ELEVATION - NORTH TOSA ROOM
1/4" = 1'-0"




4 INTERIOR ELEVATION - SOUTH TOSA ROOM
1/4" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

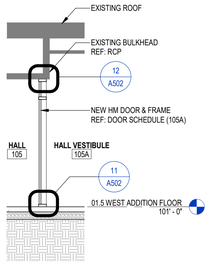
Sheet Title
INTERIOR ELEVATIONS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

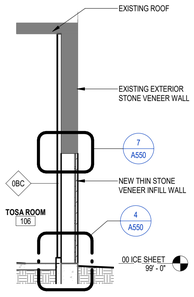
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A251

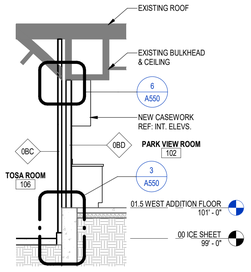
11/27/2023 8:05:00 AM



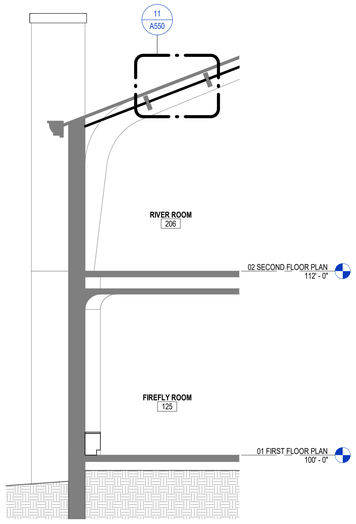

6 WALL SECTION - HALL VESTIBULE SOUTH
1/4" = 1'-0"



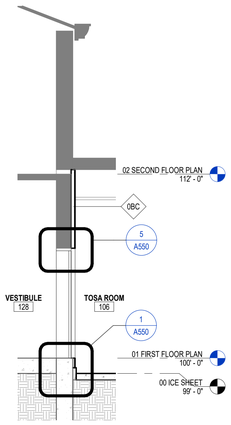

5 WALL SECTION - TOSA ROOM NORTH INFILL WALL
1/4" = 1'-0"



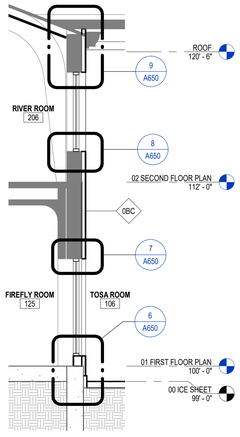

4 WALL SECTION - PARK VIEW ROOM WEST INFILL WALL
1/4" = 1'-0"




3 WALL SECTION - FIREFLY & RIVER VIEW ROOM SOUTH
1/4" = 1'-0"




2 WALL SECTION - TOSA ROOM SOUTH DOOR
1/4" = 1'-0"




1 WALL SECTION - FIREFLY & RIVER VIEW ROOM NORTH WINDOW
1/4" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF
WAUWATOSA

Sheet Title
WALL SECTIONS

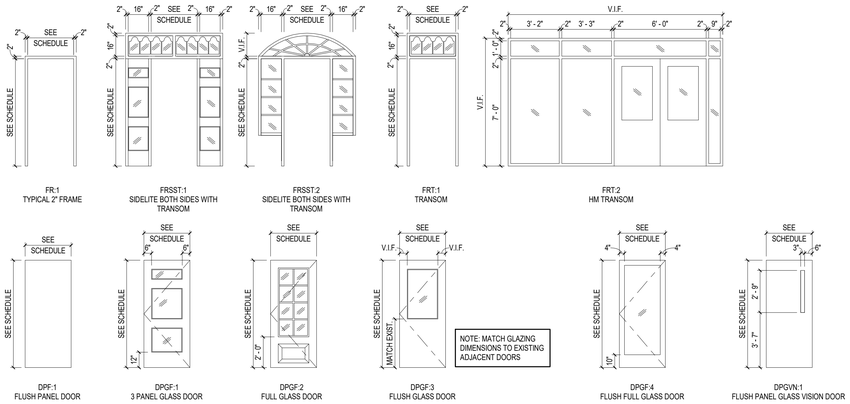
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A320

1/10/2024 8:05:00 AM

Kahler Slater




LEGEND - DOOR PANEL AND FRAME TYPES
1/4" = 1'-0"

## DOOR SCHEDULE

| | | | | | DOOR PANEL | | | | | | DOOR FRAME | | | | DETAILS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MARK | ROOM | TOTAL WIDTH | HEIGHT | THICKNESS | TYPE | PANEL A WIDTH | PANEL B WIDTH | MATERIAL | FINISH | GLAZING | TYPE | MATERIAL | FINISH | GLAZING | HEAD | JAMB | FIRE RATING | HARDWARE SET | COMMENTS | REV |
| 001 | BASEMENT | 3'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | | EX | EX | | FR : 1 | EX | EX | | | | | 13 | G | |
| 104 | GARDEN ROOM | 6'-2" | | | DPGF : 1 | | | AL | AA | GL-01 | FRT : 1 | AL | AA | GL-01 | | | | 02 | A, D | |
| 104A | STORAGE | 6'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | 3' - 0" | HM | PNT | | FR : 1 | HM | PNT | | | | | 11 | | |
| 105 | HALL | 3'-0" | | | DPGF : 1 | | | AL | AA | GL-01 | FRT : 1 | AL | AA | GL-01 | | | | 07 | A | |
| 105A | HALL VESTIBULE | 6'-0" | 7' - 0" | 1" | DPGF : 3 | 3' - 0" | 3' - 0" | WD | WV-02 | GL-04 | FRT : 2 | HM | PNT | GL-04 | | | | 09 | | |
| 106A | TOSA ROOM | 3'-0" | 7' - 0" | 1 3/4" | DPGVN : 1 | 3' - 0" | | HM | PNT | GL-04 | FR : 1 | HM | PNT | | | | | 10 | A, D | |
| 106B | TOSA ROOM | 6'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | 3' - 0" | HM | PNT | | FRD : 1 | HM | PNT | | | | | 03 | A, H | |
| 106C | TOSA ROOM | 6'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | 3' - 0" | HM | PNT | | FRD : 1 | HM | PNT | | | | | 04 | A | |
| 106D | TOSA ROOM | 6'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | 3' - 0" | HM | PNT | | FRD : 1 | HM | PNT | | | | | 03 | A, D | |
| 106E | TOSA ROOM | 6'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | 3' - 0" | HM | PNT | | FRD : 1 | HM | PNT | | | | | 03 | A, H | |
| 106F | TOSA ROOM | 6'-0" | 7' - 0" | 1" | DPGF : 4 | 3' - 0" | 3' - 0" | AL | AA | | | AL | AA | | | | | 03 | A, H | |
| 106H | TOSA ROOM | 3'-0" | 7' - 0" | 1 3/4" | DPGVN : 1 | 3' - 0" | | HM | PNT | GL-04 | FR : 1 | HM | PNT | | | | | 08 | A, B | |
| 118 | ENTRY | 6'-2" | | | DPGF : 1 | | | AL | AA | GL-01 | FRSST : 1 | AL | AA | GL-01 | | | | 01 | A, B, D | |
| 121 | OFFICE | 3'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | | WD | WV-01 | | FR : 1 | EX | EX | | | | | 16 | E | |
| 122 | VESTIBULE | 6'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | 3' - 0" | WD | WV-01 | | FR : 1 | EX | PNT | | | | | 12 | E | |
| 124 | ELEC | 3'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | | WD | WV-01 | | FR : 1 | EX | PNT | | | | | 16 | E | |
| 125A | FIREFLY ROOM | 3'-0" | 7' - 0" | 1 3/4" | DPGVN : 1 | 3' - 0" | | WD | WV-01 | GL-04 | FR : 1 | EX | PNT | | | | | 14 | D, E | |
| 125B | FIREFLY ROOM | 3'-0" | 7' - 0" | 1 3/4" | DPGVN : 1 | 3' - 0" | | WD | WV-01 | GL-04 | FR : 1 | EX | PNT | | | | | 16 | E | |
| 128A | FIREFLY ROOM | 3'-0" | 7' - 0" | 1 3/4" | DPGVN : 1 | 3' - 0" | | WD | WV-01 | GL-04 | FR : 1 | EX | PNT | | | | | 16 | E | |
| 128B | VESTIBULE | 6'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | 3' - 0" | EX | EX | | FR : 1 | EX | EX | | | | | 15 | G | |
| 132 | UTILITIES | 3'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | | FRP | | | FR : 1 | FRP | | | | | | 06 | A | |
| 201 | STOR | 3'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | | EX | PNT | | FR : 1 | EX | PNT | | | | | 16 | F | |
| 203 | VESTIBULE | 5'-5 1/2" | | | DPGF : 2 | | | AL | AA | GL-01 | FRSST : 1 | AL | AA | GL-01 | | | | 05 | A, C | |
| 206A | RIVER ROOM | 3'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | | WD | WV-01 | | FR : 1 | EX | PNT | | | | | 16 | E | |
| 206B | RIVER ROOM | 3'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | | WD | WV-01 | | FR : 1 | EX | PNT | | | | | 16 | E | |
| 206C | RIVER ROOM | 3'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | | EX | PNT | | FR : 1 | EX | PNT | | | | | 16 | F | |
| 206D | RIVER ROOM | 2'-6" | 7' - 0" | 1 3/4" | DPF : 1 | 2' - 6" | | EX | PNT | | FR : 1 | EX | PNT | | | | | 16 | F | |
| 206E | RIVER ROOM | 3'-0" | 7' - 0" | 1 3/4" | DPF : 1 | 3' - 0" | | EX | PNT | | FR : 1 | EX | PNT | | | | | 16 | F | |

## DOOR AND FRAME GENERAL NOTES

1. DOOR HARDWARE SHALL BE ADA COMPLIANT, INCLUDING LEVER HANDLE LATCH AND LOCK SETS, AND DELAY ADJUSTABLE CLOSERS AS REQUIRED.
2. OVERHEAD DOOR STOPS TO BE 110°, UNLESS NOTED OTHERWISE.
3. THRESHOLDS AT DOORWAYS SHALL NOT EXCEED THE MAXIMUM HEIGHT OF 1/2", PER 2006 IBC SEC. 1008.1.6.
4. FIELD VERIFY ALL EXISTING OPENING SIZES FOR DOOR AND FRAME REPLACEMENTS.
5. ALL PAINTED HM DOORS AND FRAMES TO MATCH ADJACENT WALLS.

## DOOR AND FRAME COMMENTS

A. EXTERIOR DOOR.

B. COORDINATE AND CONFIRM REQUIREMENTS FOR POWER, WIRING AND MOUNTING LOCATIONS FOR AUTO OPERATOR AND AUTO OPERATOR SENSOR.

C. DOOR TO BE LOCKED AT ALL TIMES AND ONLY ACCESIBLE BY MAINTENANCE STAFF.

D. ACCESS CONTROL DOOR. COORDINATE MOUNTING LOCATION FOR CARD READER. PREP EXISTING DOOR AND FRAME WHERE APPLICABLE.

E. NEW DOOR PANEL(S) ONLY. REUSE EXISTING HARDWARE AND REPAINT EXISTING FRAME.

F. STRIP, PREP, AND REPAINT EXISTING DOOR PANEL. REUSE EXISTING HARDWARE AND REPAINT EXISTING FRAME.

G. ACCESS CONTROL ONLY. PREP EXISTING DOOR AND FRAME. COORDINATE MOUNTING LOCATION FOR CARD READER.

H. PROVIDE REMOVABLE CENTER MULLION.

## ABBREVIATIONS: DOORS AND FRAMES

HM - HOLLOW METAL

AL - ALUMINUM

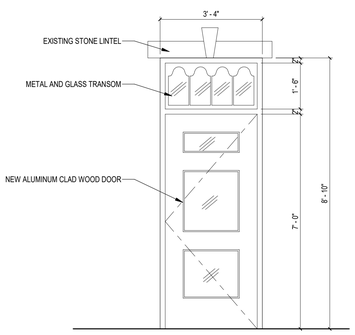
AA - ANODIZED ALUMINUM

WD - WOOD

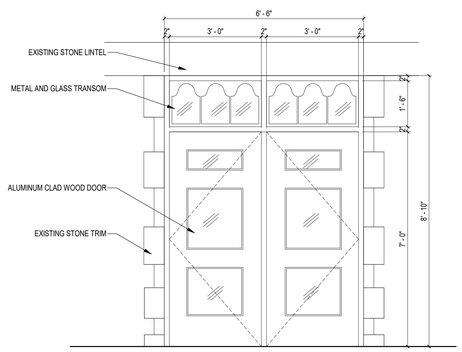
WV - WOOD VENEER

PNT - PAINT

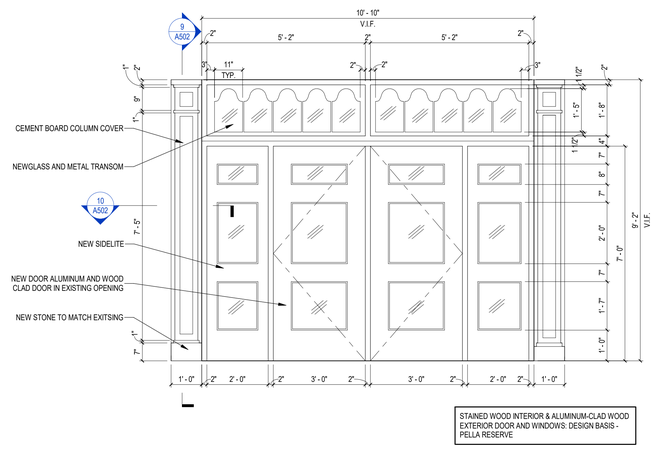
EX - EXISTING



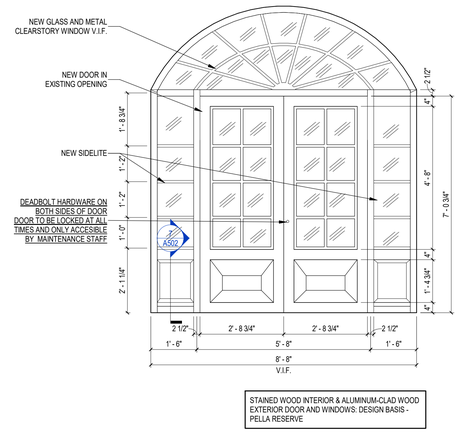

9 SIDE ENTRY DOOR
1/2" = 1'-0"



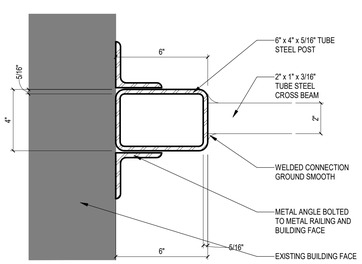

8 GARDEN ROOM ENTRY
1/2" = 1'-0"



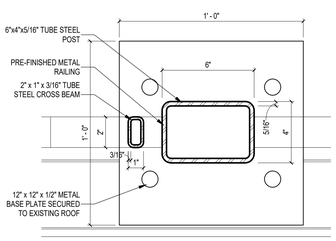

7 NEW ENTRY DOOR
1/2" = 1'-0"




6 REPLACEMENT DOOR ELEVATION
1/2" = 1'-0"



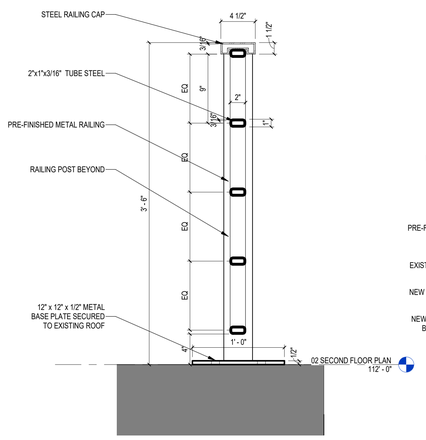

5 RAILING CONNECTION @ BUILDING
3" = 1'-0"



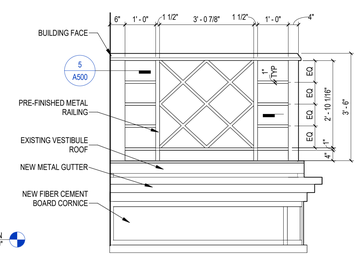

4 RAILING DETAIL
3" = 1'-0"

RAILING GENERAL NOTES

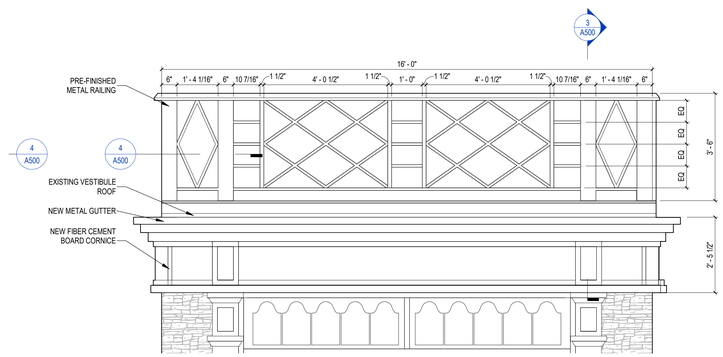
1. ALL RAILINGS AND EXPOSED STEEL STRUCTURE ARE TO BE PAINTED WITH HIGH PERFORMANCE COATING.
2. ALL RAILINGS ARE TO BE ENGINEERED AND SUPPLIED BY RAILING FABRICATOR.
3. STEEL SIZES FOR RAILINGS ARE TO BE VERIFIED BY STAIR FABRICATOR'S STRUCTURAL ENGINEER FOR FINAL DESIGN. GUARD RAILINGS AND TOP RAIL OF GUARD RAILINGS: UNIFORM LOAD OF 50 LBF/ FT. APPLIED IN ANY DIRECTION AND CONCENTRATED LOAD OF 200 LBF APPLIED IN ANY DIRECTION. INFILL OF GUARD RAILINGS: CONCENTRATED LOAD OF 50 LBF APPLIED HORIZONTALLY ON AN AREA OF 1 SQ FT.
4. PROVIDE BLOCKING/GALVANIZED ANCHORS FOR DRAILS AS REQUIRED TO MEET STRUCTURAL REQUIREMENTS. COORDINATE IN FIELD AND PATCH AND REPAIR, EXISTING CONDITIONS (ROOFING, INSULATION, BLOCKING, EXTERIOR CLADDING, ETC.) AS REQUIRED.
5. RAILING AND EXPOSED STEEL STRUCTURAL CONNECTIONS ARE TO BE WELDED AND GROUND SMOOTH, UNO.




3 RAILING SECTION
1 1/2" = 1'-0"




2 RAILING SIDE ELEVATION
1/2" = 1'-0"




1 RAILING FRONT ELEVATION
1/2" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

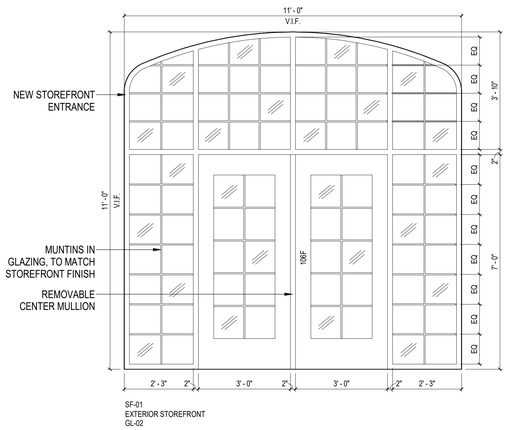
Sheet Title
DOOR SCHEDULE & EXTERIOR DETAILS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

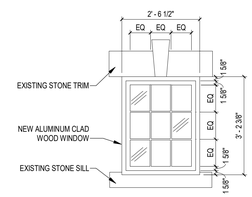
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A500

Kahler Slater

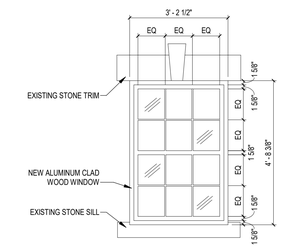



14 WINDOW TYPE N
1/2" = 1'-0"



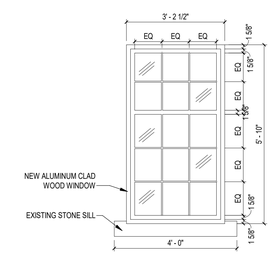

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

13 WINDOW TYPE M
1/2" = 1'-0"



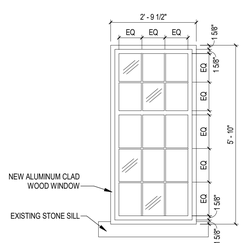

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

12 WINDOW TYPE L
1/2" = 1'-0"



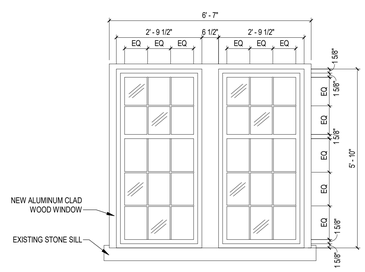

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

11 WINDOW TYPE K
1/2" = 1'-0"



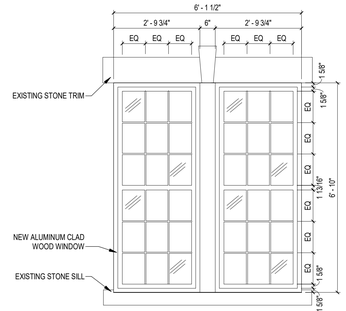

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

10 WINDOW TYPE J
1/2" = 1'-0"



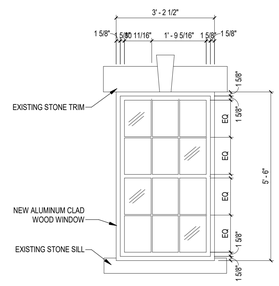

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

9 WINDOW TYPE I
1/2" = 1'-0"



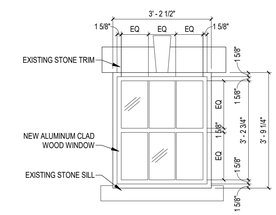

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

8 WINDOW TYPE H
1/2" = 1'-0"



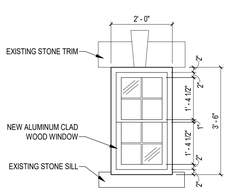

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

7 WINDOW TYPE G
1/2" = 1'-0"



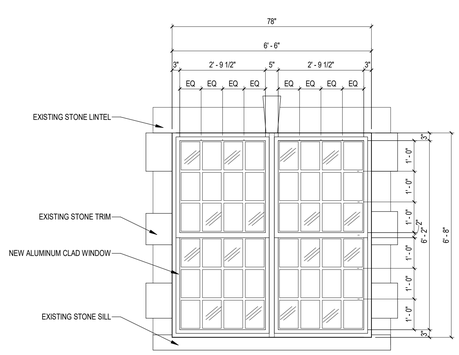

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

6 WINDOW TYPE F
1/2" = 1'-0"



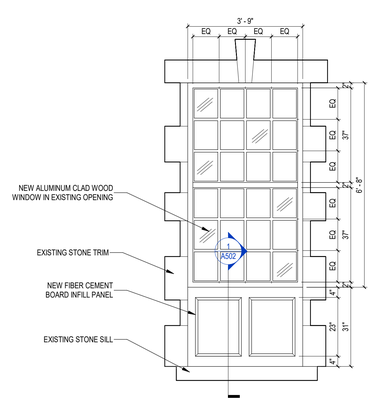

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

5 WINDOW TYPE E
1/2" = 1'-0"



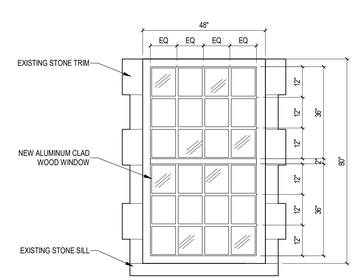

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

4 WINDOW TYPE D
1/2" = 1'-0"



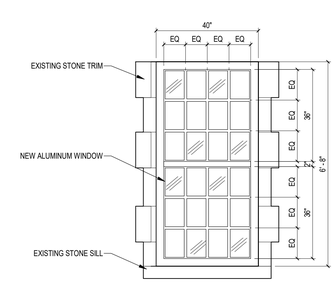

STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

3 WINDOW TYPE C
1/2" = 1'-0"




STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

2 WINDOW TYPE B
1/2" = 1'-0"




STAINED WOOD INTERIOR & ALUMINUM-CLAD WOOD EXTERIOR WINDOWS, GL-01
DESIGN BASIS - PELLA RESERVE

1 WINDOW TYPE A
1/2" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
WINDOW TYPES

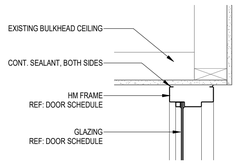
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

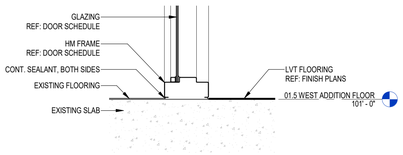
Sheet No.
A501

1/10/2024 8:05:03 AM

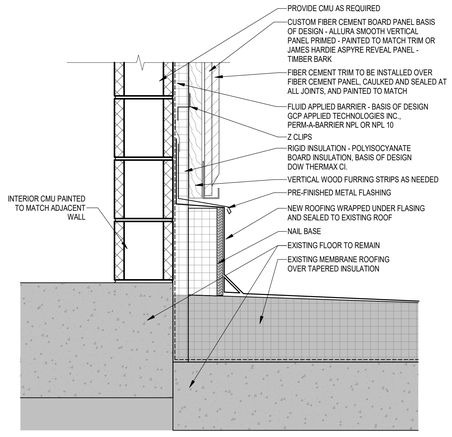
Kahler Slater



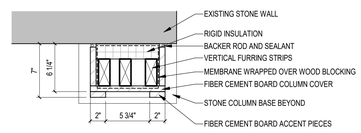

12 HALL HM DOOR/WINDOW - HEAD
1 1/2" = 1'-0"



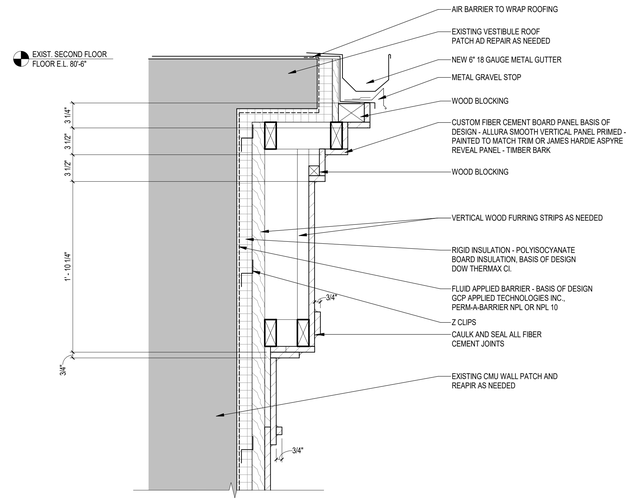

11 HALL HM DOOR/WINDOW - SILL
1 1/2" = 1'-0"

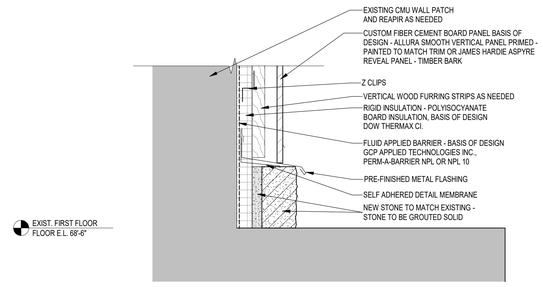



7 SIDELITE DETAIL
1 1/2" = 1'-0"

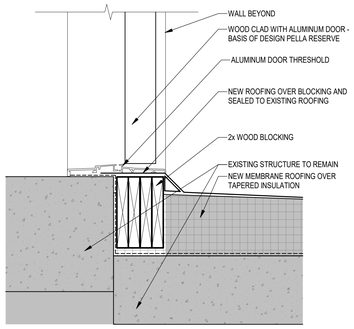



10 COLUMN COVER PLAN DETAIL
1 1/2" = 1'-0"

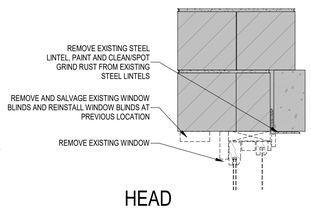


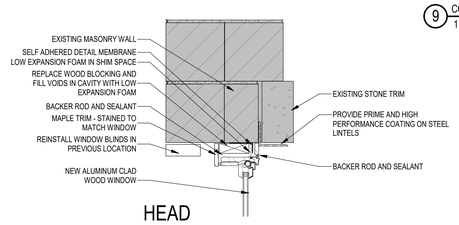

9 COLUMN COVER SECTION
1 1/2" = 1'-0"



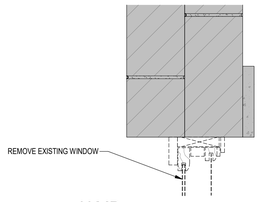

8 THRESHOLD DETAIL @ ROOF TERRACE
1 1/2" = 1'-0"



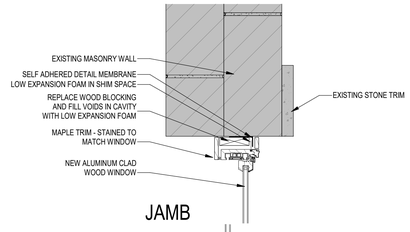

HEAD



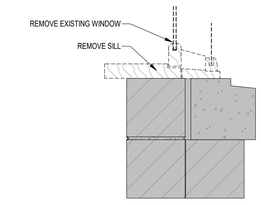

HEAD



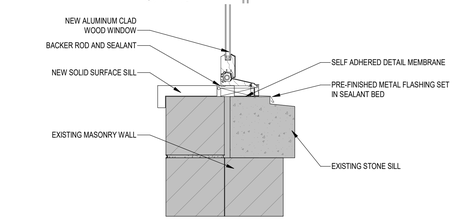

JAMB



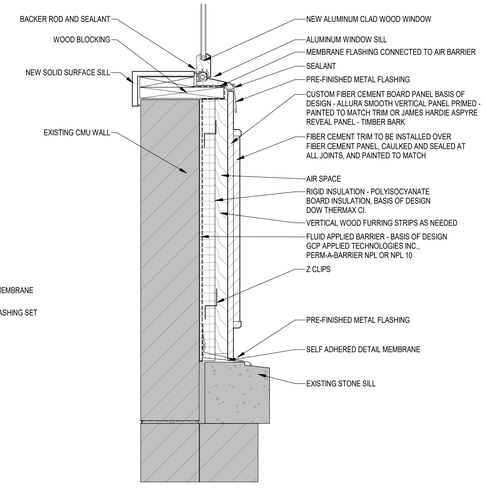

JAMB



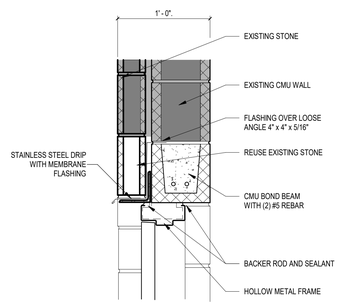

SILL



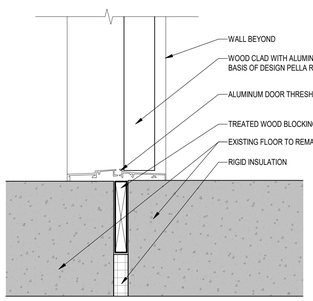

SILL



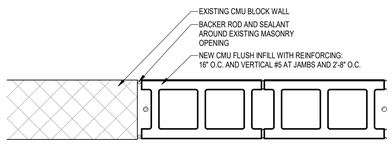

1 PANEL INFILL
1 1/2" = 1'-0"




5 DOOR DETAIL - EXTERIOR CMU
1 1/2" = 1'-0"




6 TYP. THRESHOLD DETAIL
1 1/2" = 1'-0"




4 CMU INFILL
1 1/2" = 1'-0"

3 EXISTING WINDOW
1 1/2" = 1'-0"

2 WINDOW REPLACEMENT
1 1/2" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
WINDOW & DOOR DETAILS

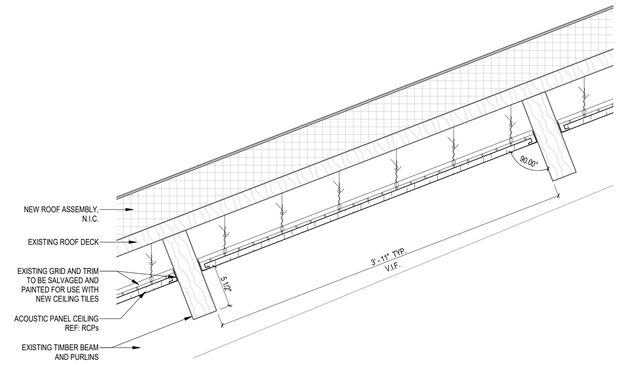
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

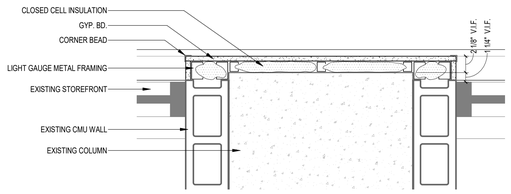
Sheet No.
A502

1/10/2024 8:05:04 AM

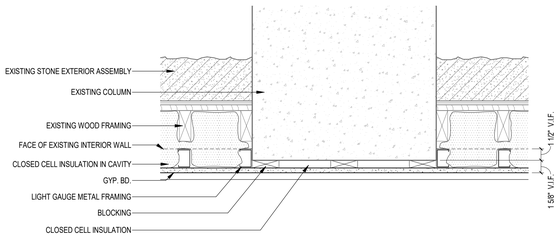
Kahler Slater



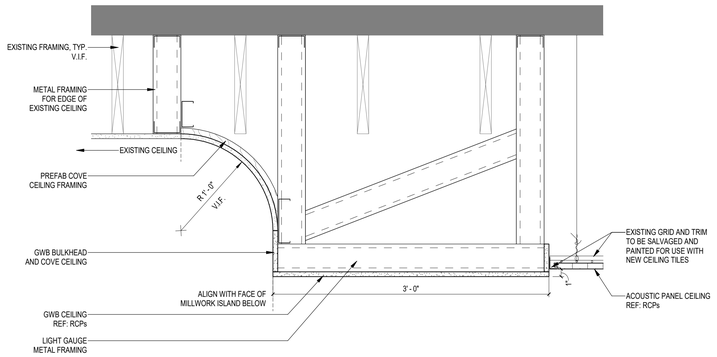

11 RIVERVIEW CEILING DETAIL
1 1/2" = 1'-0"



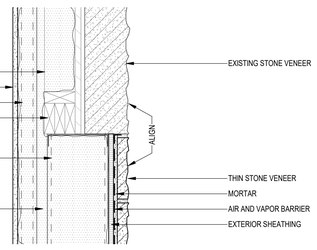

10 TYP. INTERIOR TOSA ROOM FURRING DETAIL AT COLUMN
1 1/2" = 1'-0"



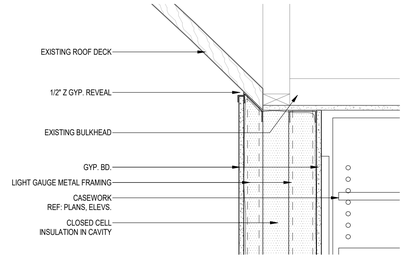

9 TYP. EXTERIOR TOSA ROOM FURRING DETAIL AT COLUMN
1 1/2" = 1'-0"



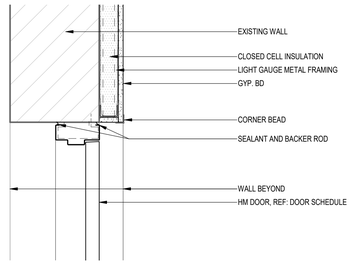

8 KITCHEN ISLAND BULKHEAD DETAIL
1 1/2" = 1'-0"



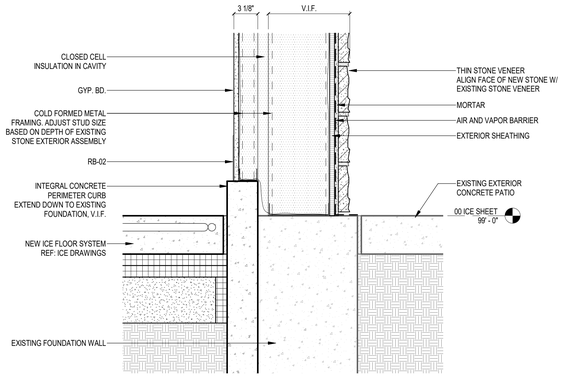

7 TOSA ROOM FURRED WALL HEAD - EXTERIOR1
1 1/2" = 1'-0"



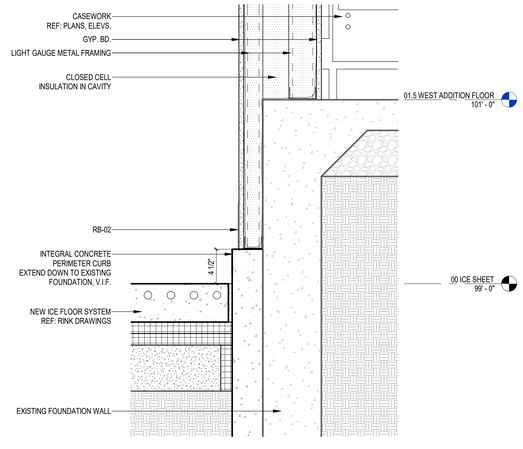

6 PARK VIEW ROOM INFILL WALL HEAD DETAIL
1 1/2" = 1'-0"



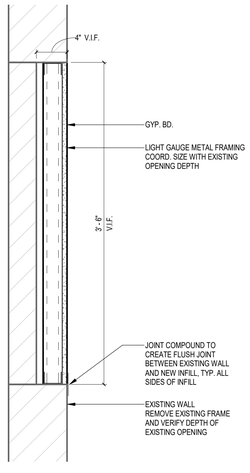

5 ICE HOUSE DOOR - HEAD DETAIL
1 1/2" = 1'-0"



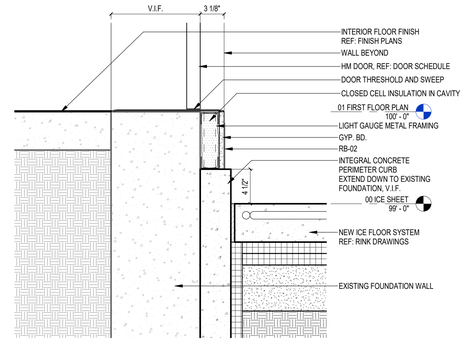

4 TOSA ROOM CURB DETAIL - EXTERIOR
1 1/2" = 1'-0"




3 PARK VIEW ROOM INFILL WALL SILL DETAIL
1 1/2" = 1'-0"




2 INFILL WALL AT FIREFLY WINDOW OPENING
1 1/2" = 1'-0"




1 ICE HOUSE DOOR - SILL DETAIL
1 1/2" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

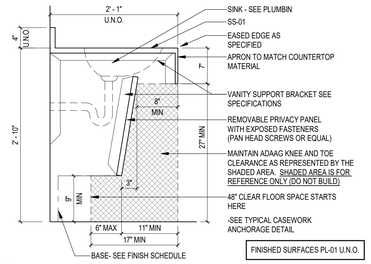
CITY OF WAUWATOSA

Sheet Title
EXTERIOR & INTERIOR DETAILS

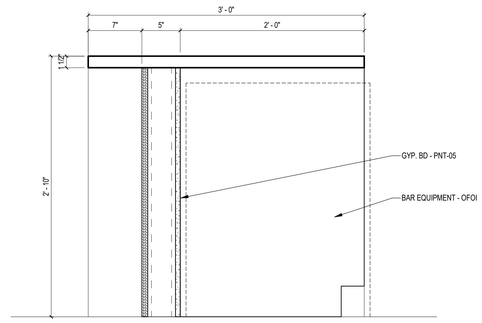
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

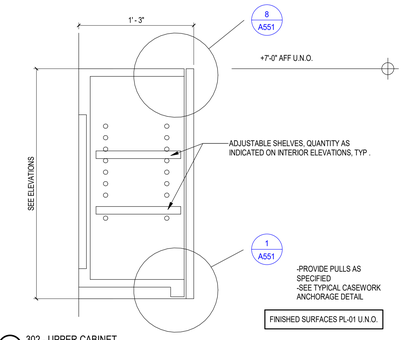
Sheet No.
A550



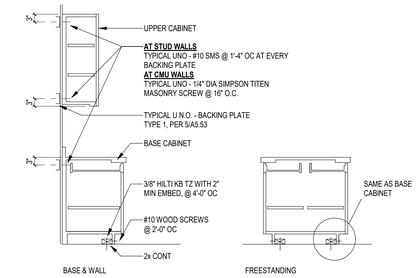

6 KNEE AND TOE CLEARANCE
1" = 1'-0"



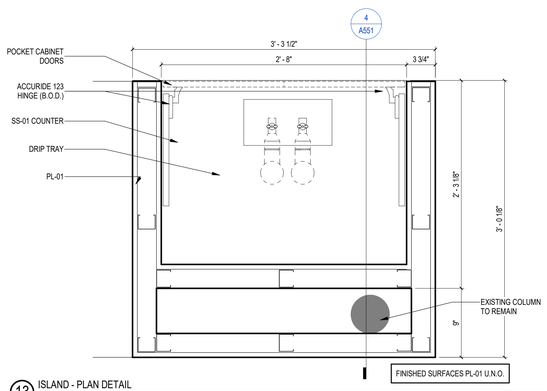

11 ISLAND DETAIL - 3
1 1/2" = 1'-0"



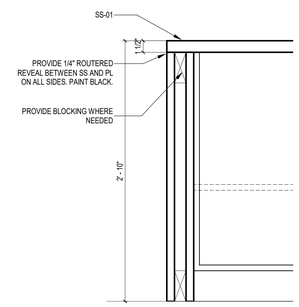

10 302 - UPPER CABINET
1 1/2" = 1'-0"



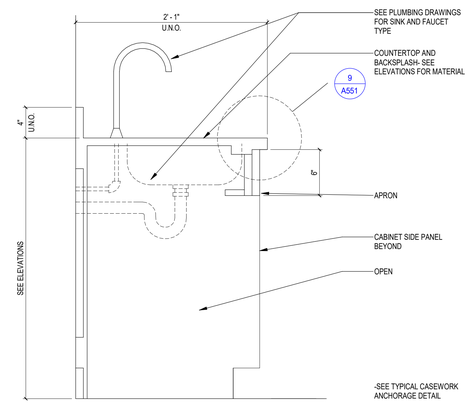

12 TYPICAL CASEWORK ANCHORAGE
1/2" = 1'-0"



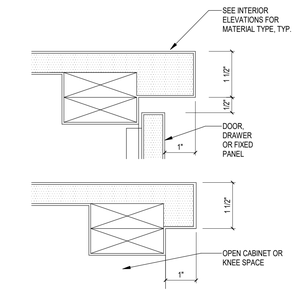

13 ISLAND - PLAN DETAIL
1 1/2" = 1'-0"



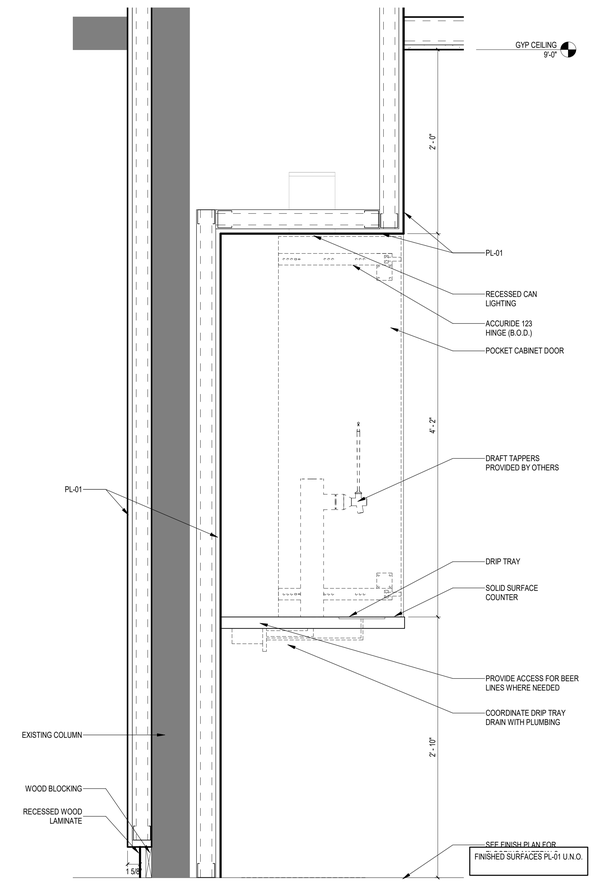

7 ISLAND DETAIL - 2
1 1/2" = 1'-0"



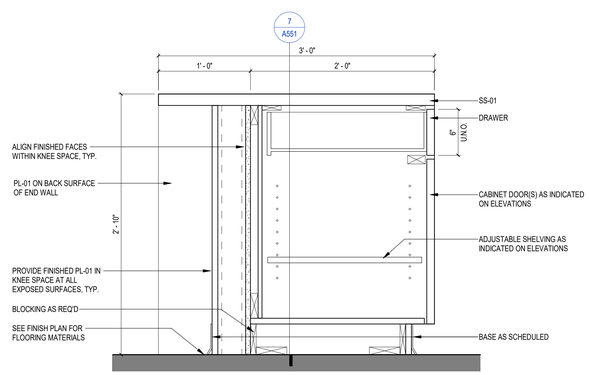

16 210M - BASE OPEN SINGLE DRAWER
1 1/2" = 1'-0"



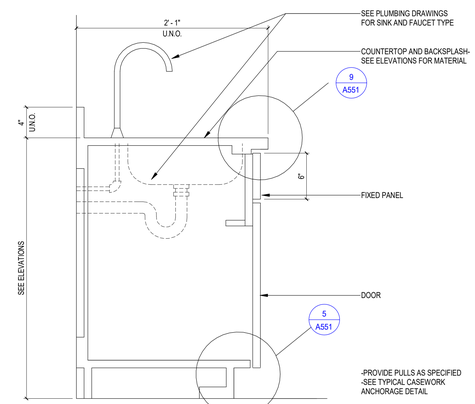

9 COUNTER EDGE
6" = 1'-0"



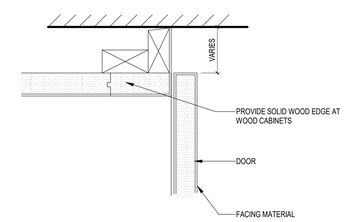

4 ISLAND DETAIL - 4
1 1/2" = 1'-0"



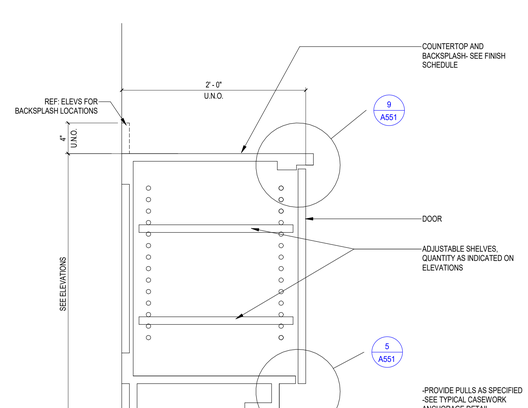

3 ISLAND DETAIL - 1
1 1/2" = 1'-0"



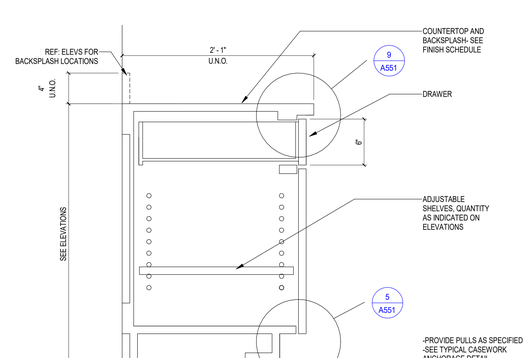

15 212S - BASE CABINET - DOOR & DRAWER
1 1/2" = 1'-0"



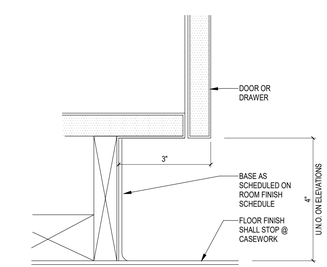

8 SECTION - TOP OF CABINET SCRIBE
6" = 1'-0"



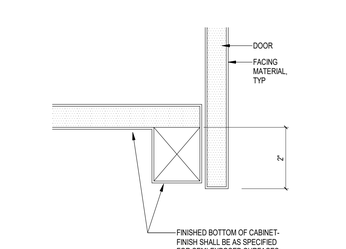

14 101/102 - BASE CABINET - DOOR
1 1/2" = 1'-0"




2 212 - BASE CABINET - DOOR & DRAWER
1 1/2" = 1'-0"




5 TOE KICK
6" = 1'-0"




1 BOTTOM OF WALL CABINET
6" = 1'-0"

Kahler Slater

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

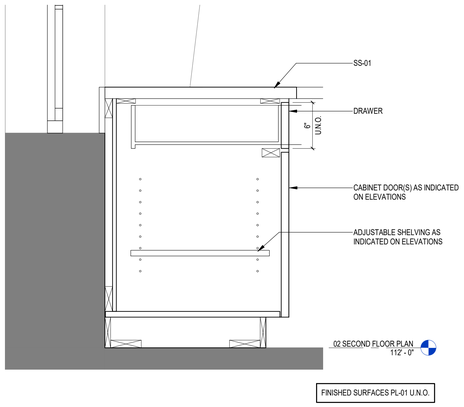
Sheet Title
MILLWORK DETAILS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

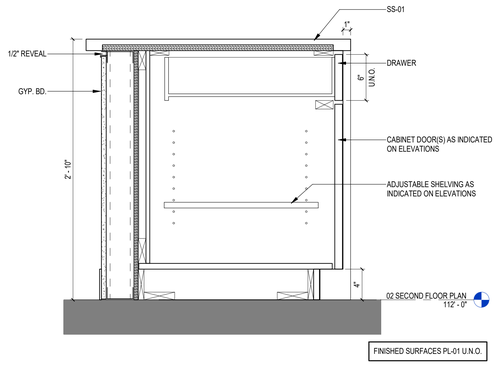
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A551

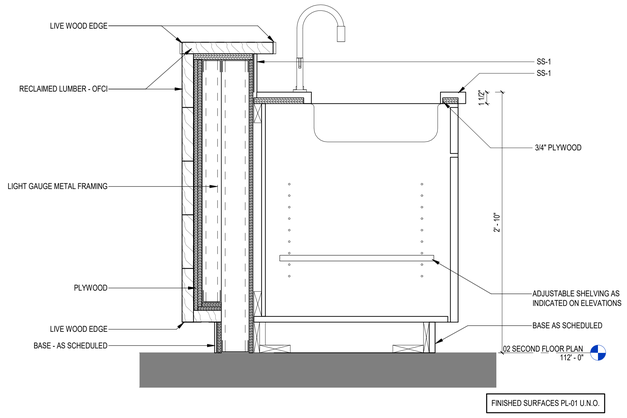
Kahler Slater



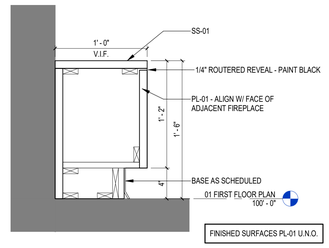

12 211 - RIVER ROOM MILLWORK - CABINET DETAIL
1 1/2" = 1'-0"



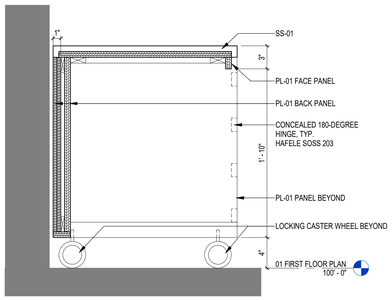

11 211 - RIVER ROOM MILLWORK - CABINET DETAIL 2
1 1/2" = 1'-0"



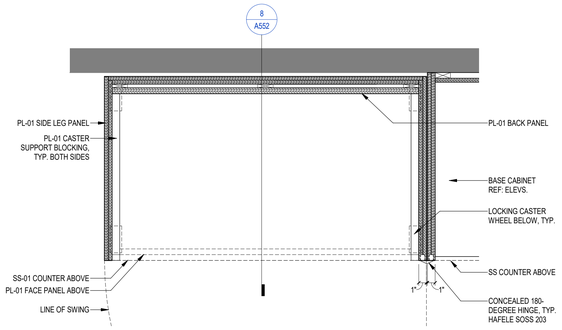

10 212 - RIVER ROOM MILLWORK - SINK DETAIL
1 1/2" = 1'-0"



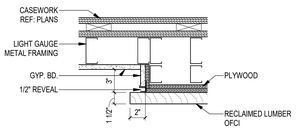

9 FIREFLY MILLWORK - BENCH DETAIL
1 1/2" = 1'-0"



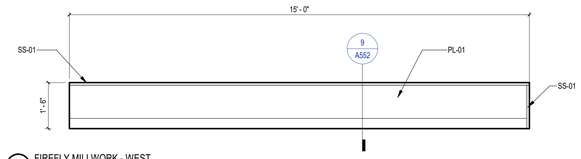

8 SWINGING DESK - SECTION DETAIL
1 1/2" = 1'-0"



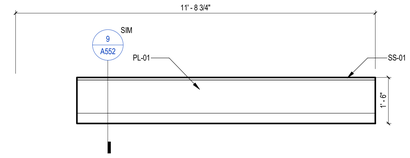

7 SWINGING DESK - PLAN DETAIL
1 1/2" = 1'-0"



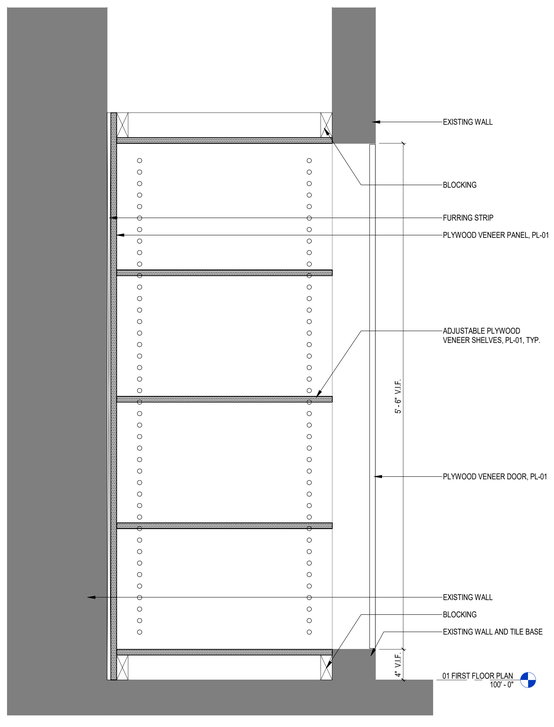

6 RIVERVIEW ROOM MILLWORK - REVEAL PLAN DETAIL
1 1/2" = 1'-0"



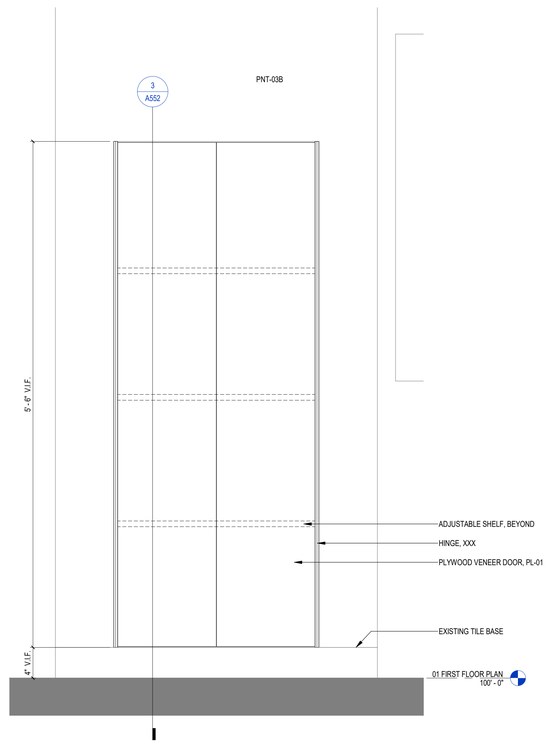

5 FIREFLY MILLWORK - WEST
1/2" = 1'-0"



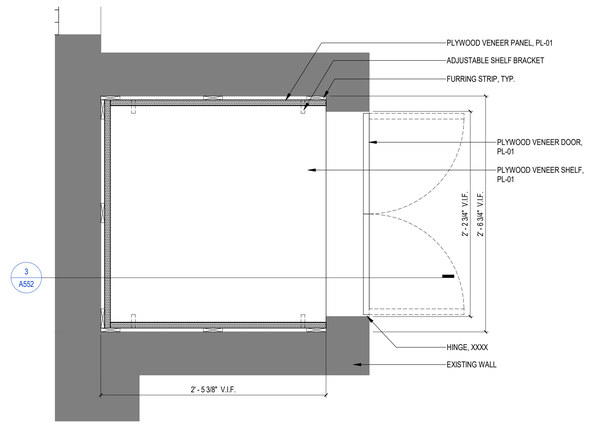

4 FIREFLY MILLWORK - EAST
1/2" = 1'-0"




3 DUMBWAITER - SECTION DETAIL
1 1/2" = 1'-0"




2 DUMBWAITER - ELEVATION
1 1/2" = 1'-0"




1 DUMBWAITER - PLAN DETAIL
1 1/2" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

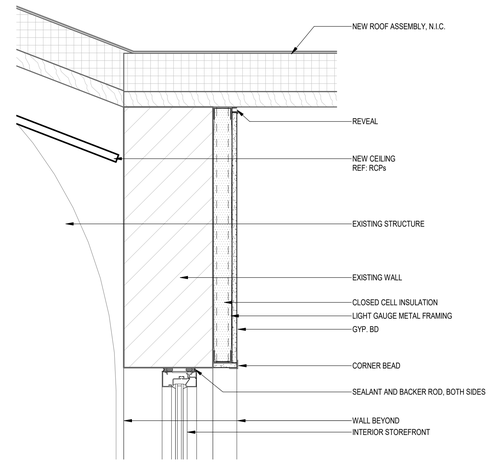
Sheet Title
MILLWORK DETAILS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

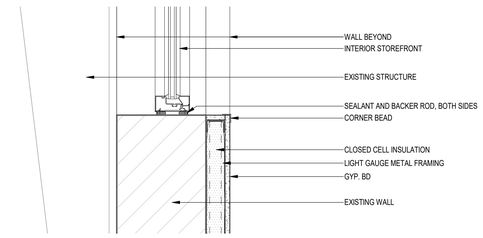
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A552

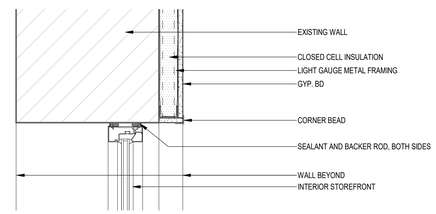
Kahler Slater



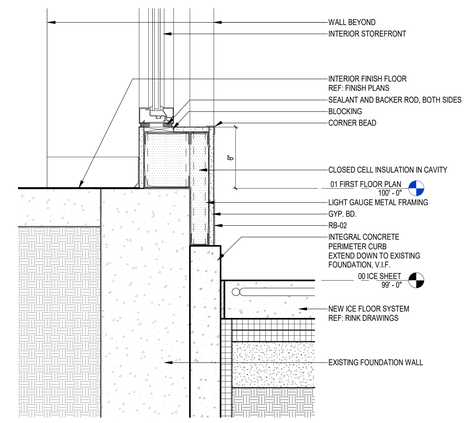

9 Detail 4
1 1/2" = 1'-0"



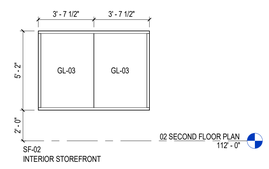

8 Detail 5
1 1/2" = 1'-0"



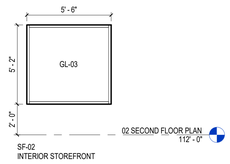

7 Detail 6
1 1/2" = 1'-0"



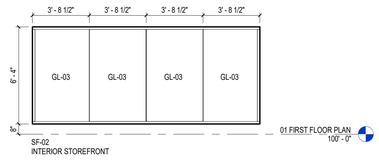

6 Detail 7
1 1/2" = 1'-0"



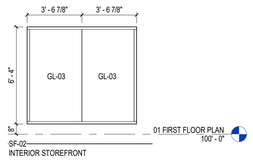

4 INTERIOR WINDOW TYPE 4
1/4" = 1'-0"




3 INTERIOR WINDOW TYPE 3
1/4" = 1'-0"




2 INTERIOR WINDOW TYPE 2
1/4" = 1'-0"




1 INTERIOR WINDOW TYPE 1
1/4" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
INTERIOR WINDOW TYPES & DETAILS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
A650

1/10/2024 8:05:08 AM

Kahler Slater

# GENERAL

1. ALL MATERIALS, CONSTRUCTION, PLANS AND DETAILS SHALL CONFORM WITH THE APPLICABLE CODES AND STANDARDS AS SHOWN IN THESE DRAWINGS AS WELL AS THE PROJECT SPECIFICATIONS, FIRE UNDERWRITER RULES AND REGULATIONS AND ASTM STANDARDS RELATED TO EACH ELEMENT.
2. THE GENERAL CONTRACTOR AND ALL SUBCONTRACTORS SHALL BE FAMILIAR WITH THE ENTIRE SET OF CONSTRUCTION DOCUMENTS (NOT LIMITED TO CIVIL, ARCHITECTURAL, PLUMBING, ELECTRICAL, STRUCTURAL, AND MECHANICAL, ETC.) IN ORDER TO PROVIDE ALL CONSTRUCTION AND MATERIALS FOR THE PROJECT.
3. THE CONTRACTOR SHALL REFER TO ALL DRAWINGS OF THE CONSTRUCTION DOCUMENTS FOR ADDITIONAL SPECIFIED ITEMS SUCH AS MEMBERS, ELEVATIONS, BRICK LEDGES, DIMENSIONS, SLEEVES, PENETRATIONS, DEPRESSIONS, ETC. NOT SHOWN ON THE STRUCTURAL DRAWINGS THAT MAY BE REQUIRED FOR COMPLETION OF THE PROJECT.
4. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND ELEVATIONS PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ARCHITECT AND STRUCTURAL ENGINEER.
5. DETAILS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE DUPLICATED IN SIMILAR PORTIONS OF THE BUILDING UNLESS NOTED OTHERWISE.
6. DRAWINGS REPRESENT THE FINISHED STRUCTURAL SYSTEM AND DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS AND METHODS, TECHNIQUES, SEQUENCES, PROCEDURES, LAGGING, SHORING, BRACING, FORM WORK, ETC. AS REQUIRED FOR THE PROTECTION AND SAFETY OF LIFE AND PROPERTY DURING CONSTRUCTION. OBSERVATION VISITS TO THE SITE BY THE ARCHITECT OR STRUCTURAL ENGINEER WILL NOT INVOLVE REVIEW OF THESE ITEMS.
7. ALL INSPECTIONS REQUIRED BY THE BUILDING CODES, JURISDICTION OR THESE PLANS SHALL BE PROVIDED BY AN INDEPENDENT INSPECTION AGENCY OR THE BUILDING DEPARTMENT. SITE VISITS BY THE ARCHITECT OR STRUCTURAL ENGINEER DO NOT CONSTITUTE AN INSPECTION.
8. CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR FULL COMPLIANCE WITH ALL LOCAL, STATE AND FEDERAL REGULATIONS CONCERNING THE HEALTH AND SAFETY OF WORKERS AND THE PUBLIC IN AND AROUND THE CONSTRUCTION SITE.
9. CONSTRUCTION MATERIALS SHALL BE UNIFORMLY LAID OUT SUCH THAT NOTED STRUCTURAL DESIGN LIVE LOAD PER SQUARE FOOT IS NOT EXCEEDED.
10. PLANS ARE NOT TO BE SCALED.
11. NOTES ON SPECIFIC PLANS AND DETAILS AS SHOWN ON THE DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS.
12. IN NO CASE SHALL STRUCTURAL ALTERATIONS, MODIFICATIONS OR WORK AFFECTING STRUCTURAL MEMBERS BE MADE WITHOUT WRITTEN APPROVAL OF THE STRUCTURAL ENGINEER.
13. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND ELEVATIONS RELATED TO ELEVATOR/ESCALATOR/EQUIPMENT PITS AND SHAFTS WITH SELECTED MANUFACTURER.
14. CONTRACTOR SHALL CONFIRM ELEVATOR/ESCALATOR/EQUIPMENT SUPPORT BEAM/GUIDE RAIL ELEVATIONS AND LOCATIONS WITH THE APPROVED ELEVATOR/ESCALATOR/EQUIPMENT SHOP DRAWINGS.
15. REFER TO ARCHITECTURAL DRAWINGS FOR FIRE RATING REQUIREMENTS.
16. UNLESS NOTED OTHERWISE, CENTERLINE OF FRAMING ELEMENTS COINCIDE WITH COLUMN CENTERLINES. FRAMING BETWEEN MEMBERS SHALL BE EQUALLY SPACED UNLESS NOTED OTHERWISE.
17. IF ANY ERRORS OR OMISSIONS APPEAR IN THESE DRAWINGS, SPECIFICATIONS OR OTHER DOCUMENTS, THE CONTRACTOR SHALL NOTIFY THE ARCHITECT AND STRUCTURAL ENGINEER IN WRITING PRIOR TO PROCEEDING WITH WORK.
18. NO PROVISIONS HAVE BEEN MADE FOR FUTURE EXPANSION.

# EXISTING CONSTRUCTION

1. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING STRUCTURAL ELEMENTS, DIMENSIONS AND ELEVATIONS RELATED TO EXISTING CONDITIONS AND NEW CONSTRUCTION PRIOR TO CONSTRUCTION AND PROCUREMENT OF MATERIAL. CONTRACTOR TO NOTIFY ARCHITECT AND STRUCTURAL ENGINEER OF ANY DISCREPANCIES. EXISTING CONDITIONS SHOWN REPRESENT THE BEST AVAILABLE INFORMATION. NO WARRANTY IS MADE TO THE ACCURACY OF THE INFORMATION PRESENTED.
2. REMOVE, REPLACE, AND MODIFY ALL EXISTING MATERIAL (ARCHITECTURAL, ELECTRICAL, MECHANICAL, STRUCTURAL, ETC.) AS REQUIRED TO PLACE NEW STRUCTURAL WORK SHOWN IN THE CONSTRUCTION DOCUMENTS.
3. ANY EXISTING CONDITIONS THAT ARE UNCOVERED DURING THE COURSE OF THE PROJECT THAT THE CONTRACTOR DEEMS UNSAFE SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE ARCHITECT AND STRUCTURAL ENGINEER.
4. CONTRACTOR IS SOLELY RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF SHORING, BRACING, ETC. REQUIRED TO SAFELY CONSTRUCT THE PROJECT.

# CAST-IN-PLACE CONCRETE

- CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH ACI 318 "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" AND ACI 301 "SPECIFICATIONS FOR STRUCTURAL CONCRETE."
- CONCRETE SLAB CONSTRUCTION SHALL BE IN ACCORDANCE WITH ACI 302 "GUIDE TO CONCRETE FLOOR AND SLAB CONSTRUCTION."
- CONCRETE MIXING, TRANSPORTING AND PLACEMENT SHALL CONFORM TO ACI 304 "GUIDE FOR MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE."
- CONCRETE PLACED DURING HOT OR COLD WEATHER SHALL CONFORM TO ACI 305 "GUIDE TO HOT WEATHER CONCRETING" AND ACI 306 "GUIDE TO COLD WEATHER CONCRETING."
- CONCRETE SHALL BE MECHANICALLY CONSOLIDATED IN ACCORDANCE WITH ACI 309 "GUIDE FOR CONSOLIDATION OF CONCRETE." SLAB-ON-GRADE NEED ONLY BE VIBRATED AROUND EMBEDDED ITEMS, THICKENED SLABS, TRENCHES, FLOOR DRAINS, ETC.
- CONCRETE CURING SHALL CONFORM TO ACI 308 "GUIDE TO EXTERNAL CURING OF CONCRETE" OR ACI 318 "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE," WHICHEVER IS APPLICABLE UNLESS ALTERNATE METHODS ARE APPROVED BY ARCHITECT AND STRUCTURAL ENGINEER. WHERE CURING COMPOUNDS ARE APPROVED, CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING COMPATIBILITY WITH FLOORING PRIOR TO CURING COMPOUND APPLICATION.
- MAXIMUM UNCONFINED CONCRETE FREE FALL SHALL BE LIMITED TO 5'-0".
- WATER SHALL BE CLEAN AND POTABLE AND SHALL CONFORM TO ASTM C94. NO WATER SHALL BE ADDED AT THE JOBSITE UNLESS SPECIFICALLY APPROVED IN WRITING BY THE CONCRETE SUPPLIER.
- CONCRETE MIXING OPERATION SHALL CONFORM TO ASTM C94.
- CLEAR COVER REQUIREMENTS FOR CONCRETE REINFORCEMENT SHALL CONFORM TO THE FOLLOWING UNLESS SPECIFICALLY NOTED OTHERWISE:
  - CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH 3"
  - CONCRETE EXPOSED TO EARTH OR WEATHER
    - #5 AND SMALLER 1-1/2"
    - #6 THROUGH #18 2"
  - CONCRETE NOT EXPOSED TO WEATHER OR IN CONTACT WITH GROUND
    - SLABS, WALLS, JOISTS: #11 AND SMALLER 3/4"
    - BEAMS, COLUMNS: PRIMARY, TIES, STIRRUPS OR SPIRALS 1-1/2"
- UNLESS OTHERWISE DETAILED, PROVIDE (2) #5 BARS AROUND ALL OPENINGS AND (2) #5 DIAGONAL BARS AT ALL OPENINGS AND RE-ENTRANT CORNERS. BARS SHALL EXTEND A MINIMUM OF 30" PAST OPENING.
- EXISTING SURFACES THAT ARE TO RECEIVE NEW CONCRETE SHALL BE INTENTIONALLY ROUGHENED TO AN AMPLITUDE OF 1/4" UNLESS NOTED OTHERWISE.
- BASE PLATE GROUT SHALL BE NON-SHRINK, NON-METALLIC WITH A MINIMUM COMPRESSIVE STRENGTH OF 8,000 PSI. THICKNESS SHALL BE AS DETAILED.
- ALL EXPOSED CONCRETE EDGES SHALL HAVE A 3/4" CHAMFER UNLESS SPECIFICALLY DETAILED OTHERWISE. TOP SURFACES OF WALLS EXPOSED TO VIEW SHALL BE FINISHED SMOOTH UNLESS NOTED OTHERWISE.
- ALL REINFORCING BARS, ANCHOR BOLTS, WIRE MESH, DOWELS, AND OTHER CONCRETE INSERTS SHALL BE WELL SECURED IN FINAL POSITION PRIOR TO PLACING CONCRETE.
- PROVIDE SLEEVES FOR PLUMBING, ELECTRICAL AND MECHANICAL PENETRATIONS. PENETRATIONS THROUGH BEAMS AND COLUMNS ARE ONLY PERMITTED WHERE SPECIFICALLY SHOWN ON THE STRUCTURAL DRAWINGS. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS INDICATING LOCATION OF ALL PENETRATIONS AND EMBEDDED CONDUIT THROUGH OR IN CONCRETE. CONCRETE IS NOT TO BE CUT OR CORED WITHOUT PRIOR APPROVAL OF STRUCTURAL ENGINEER. COORDINATION OF OTHER TRADES RELATED TO THE CONCRETE WORK IS THE RESPONSIBILITY OF THE CONTRACTOR.
- CONDUIT, PIPES OR SIMILAR ITEMS RUNNING THROUGH OR IN CONCRETE SHALL BE PLACED SO THEY ARE NOT CLOSER THAN 3 DIAMETERS ON CENTER. CONCRETE COVER IS NOT LESS THAN 1" AND NO REINFORCING STEEL IS DISPLACED UNLESS APPROVED BY THE STRUCTURAL ENGINEER.
- CALCIUM CHLORIDE SHALL NOT BE USED IN CONCRETE MIXES.
- CONTRACTOR IS RESPONSIBLE FOR REPAIR OF IRREGULARITIES OR DEFECTS IN CONCRETE WORK PRIOR TO PLACEMENT OF FINISH MATERIALS.
- CONTRACTOR SHALL SUBMIT CONCRETE MIX DESIGNS AND TEST DATA COMPLIANT WITH REFERENCED ACI STANDARDS AND THE LOCAL BUILDING CODE. MIX DESIGNS SHALL INCLUDE THE PROJECT NAME AND INDICATE WHERE EACH MIX IS TO BE USED IN THE STRUCTURE.
- CONTRACTOR SHALL HIRE A MATERIALS TESTING LABORATORY TO CAST AND TEST CYLINDERS. SAMPLING, PREPARATION AND TESTING SHALL CONFORM TO ASTM C172, ASTM C31 AND ASTM C39. TEST RESULTS MUST BE SUBMITTED TO ARCHITECT AND STRUCTURAL ENGINEER. ACCEPTANCE CRITERIA WILL BE BASED ON ACI 318. TEST RESULTS SHALL PROVIDE THE FOLLOWING INFORMATION AT A MINIMUM.
  - LOCATION IN PROJECT WHERE SAMPLE WAS TAKEN WITH MIX DESIGNATION.
  - COMPRESSIVE STRENGTH AT 7 DAYS.
  - COMPRESSIVE STRENGTH AT 28 DAYS.
  - AIR CONTENT.
  - SLUMP.
  - WATER ADDED AT JOB SITE.
- SHOP DRAWINGS FOR REINFORCEMENT DETAILING, FABRICATING, BENDING AND PLACING OF CONCRETE REINFORCEMENT SHALL CONFORM TO ACI 318 AND CRSI MANUAL OF STANDARD PRACTICE. BAR SCHEDULES, STIRRUP SPACING, BENT BAR DIAGRAMS, AND ARRANGEMENT OF REINFORCEMENT SHALL BE SHOWN.
- CONCRETE REINFORCING BARS SHALL CONFORM TO ASTM A615 (GRADE 60).
- ALL SPLICES IN CONCRETE REINFORCEMENT SHALL BE CLASS B LAP SPLICES UNLESS NOTED OTHERWISE. ADJACENT SPLICES SHALL BE STAGGERED A MINIMUM OF 3'-0" UNLESS DETAILED OTHERWISE. REFER TO LAP SPLICE AND DEVELOPMENT LENGTH SCHEDULE.
- PROVIDE CORNER BARS AT ALL CORNERS AND WALL INTERSECTIONS.
- SLAB-ON-GRADE CONTROL JOINTS SHALL BE PLACED AS INDICATED ON STRUCTURAL DRAWINGS. SAW CUTTING SHALL BE PERFORMED AS SOON AS CUT WILL NOT RAVEL THE JOINT.
- 1/2" EXPANSION JOINT MATERIAL SHALL BE PLACED WHERE SLABS ABUT ALL VERTICAL SURFACES.
- WELDED WIRE FABRIC SHALL CONFORM TO ASTM A1064. WELDED WIRE FABRIC SHALL BE LAPPED ONE WIRE SPACE PLUS 2" FOR PLAIN WIRE AND 8" FOR DEFORMED WIRE.
- SMOOTH FACED FORMS SHALL BE USED FOR ALL CONCRETE EXPOSED TO VIEW.

# STRUCTURAL STEEL

1. DESIGN, DETAILING (INCLUDING CONNECTIONS), FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL BE IN ACCORDANCE WITH CODE REFERENCED STANDARDS OF AISC 360 "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS" AND AISC 303 "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES."
2. WELDS SHALL CONFORM TO AWS D1.1 UNLESS NOTED OTHERWISE. WELDING SHALL BE DONE BY WELDERS HOLDING CURRENT CERTIFICATES IN THE TYPE OF WELDS SHOWN ON THE CONSTRUCTION DRAWINGS. ALL MISCELLANEOUS FILLET WELDS NOT NOTED, INCLUDING THOSE FOR STIFFENERS, MISCELLANEOUS PLATES, ETC SHALL BE PER AISC 360, TABLE 2.4
3. CONTRACTOR SHALL SUBMIT STRUCTURAL STEEL SHOP DRAWINGS IN ACCORDANCE WITH AISC 360 AND AISC 303. CONTRACTOR MUST REVIEW AND STAMP SHOP DRAWINGS PRIOR TO SUBMITTING TO THE ARCHITECT.
4. CONTRACTOR SHALL DETERMINE, FURNISH AND INSTALL TEMPORARY BRACING REQUIRED TO SAFELY ERECT STRUCTURAL STEEL IN ACCORDANCE WITH AISC 303 AND OSHA REQUIREMENTS. BRACING SHALL BE LEFT IN PLACE UNTIL THE PERMANENT STRUCTURE IS IN PLACE AND SECURE.
5. STRUCTURAL STEEL SHALL BE TRUE AND PLUMB BEFORE FINAL CONNECTIONS ARE SECURED AND PRIOR TO PLACING OR APPLYING OTHER MATERIALS TO THE BUILDING STRUCTURE.
6. BEAMS SHALL BE ERECTED WITH THE NATURAL OR DESIGN CAMBER (WITHIN MILL TOLERANCE) WITH THE CROWN OF THE CAMBER AT THE TOP.
7. CONTRACTOR SHALL COORDINATE WORK BETWEEN THE STEEL SUPPLIER AND STEEL JOIST SUPPLIER.
8. STEEL CONNECTIONS SHALL BE DETAILED AS INDICATED ON THE CONSTRUCTION DRAWINGS. WHERE CONNECTIONS ARE NOT DETAILED, THE FABRICATOR IS ALLOWED TO DETAIL THE CONNECTIONS BASED ON THE BEAM REACTIONS SHOWN AND THE FOLLOWING:
   A. ALL REACTIONS ARE SERVICE LEVEL.
   B. SELECTION OF CONNECTIONS SHALL BE BASED ON ASD.
   C. USE OF STANDARD DETAILS SHOWN ON CONSTRUCTION DRAWINGS.
9. ALTERNATE CONNECTIONS TO THOSE SHOWN MAY BE CONSIDERED. APPROVAL BY THE STRUCTURAL ENGINEER IS REQUIRED.
10. ANY HOLES, CUTS OR COPING OF STEEL IN THE FIELD MUST BE APPROVED BY THE STRUCTURAL ENGINEER PRIOR TO WORK. CONTRACTOR SHALL COORDINATE ALL HOLES REQUIRED BY OTHER TRADES WITH STRUCTURAL ENGINEER PRIOR TO WORK.
11. OVERSIZED OR SLOTTED HOLES SHALL NOT BE USED FOR ANY CONNECTIONS UNLESS SPECIFICALLY INDICATED ON THE CONSTRUCTION DRAWINGS OR APPROVED BY THE STRUCTURAL ENGINEER.
12. ALL BOLTS SHALL BE A325-N UNLESS NOTED OTHERWISE AND INSTALLED SNUG TIGHT UNLESS NOTED OTHERWISE. BOLTS SHALL CONFORM TO THE "SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS."
13. SPLICES SHALL BE ALLOWED ONLY AT LOCATIONS INDICATED ON CONSTRUCTION DRAWINGS UNLESS APPROVED BY STRUCTURAL ENGINEER.
14. CONTRACTOR SHALL COORDINATE EMBEDDED ITEMS AND CONNECTION MATERIALS THAT ARE PART OF THE WORK OF OTHER TRADES BUT THAT WILL RECEIVE STRUCTURAL STEEL.
15. BASE PLATES SHALL BE GROUTED IMMEDIATELY AFTER THE STRUCTURAL STEEL FRAME OR PORTION THEREOF HAS BEEN PLUMBED.
16. STAIRS, HANDRAILS, AND GUARDRAILS SHALL BE DESIGNED AND DETAILED BY THE STEEL SUPPLIER. CONNECTIONS INTO SURROUNDING STRUCTURE SHALL BE APPROVED BY THE STRUCTURAL ENGINEER.
17. PROVIDE 3/16" CAP PLATES AT THE ENDS OF ALL EXPOSED HSS AND PIPE MEMBERS, UNLESS NOTED OTHERWISE.
18. WEEP HOLES SHALL BE PROVIDED IN EXTERIOR HSS AND PIPE COLUMNS. HOLES SHALL BE 1/2" DIA AND CENTERED 1" ABOVE THE BASEPLATE.
19. COAT STEEL BELOW GRADE STEEL SUBJECTED TO MOISTURE WITH COLD APPLIED ASPHALT EMULSION PER ASTM D1187.
20. REFER TO ARCHITECTURAL PLANS FOR MISCELLANEOUS STEEL NOT DETAILED ON THE STRUCTURAL PLANS.

# SHOP DRAWINGS

1. SHOP DRAWINGS SHALL BE SUBMITTED FOR ALL STRUCTURAL ITEMS IN ADDITION TO ITEMS REQUIRED BY PROJECT SPECIFICATIONS.
2. THE CONTRACTOR SHALL REVIEW AND STAMP ALL SHOP DRAWINGS PRIOR TO SUBMITTING TO THE ARCHITECT. ITEMS NOT IN CONFORMANCE WITH THE CONTRACT DOCUMENTS SHALL BE NOTED UPON CONTRACTOR'S REVIEW.
3. ANY CHANGES, SUBSTITUTIONS, OR DEVIATIONS FROM THE CONTRACT DOCUMENTS SHALL BE CLOUDED BY THE MANUFACTURER OR FABRICATOR. ANY OF THE AFOREMENTIONED ITEMS THAT ARE NOT CLOUDED OR NOTED BY SUBMITTING PARTIES, SHALL NOT BE CONSIDERED APPROVED AFTER ENGINEER'S REVIEW UNLESS NOTED ACCORDINGLY.
4. THE ENGINEER HAS THE RIGHT TO APPROVE OR DISAPPROVE ANY CHANGES TO CONTRACT DOCUMENTS AT ANYTIME BEFORE OR AFTER SHOP DRAWING REVIEW.
5. THE SHOP DRAWINGS DO NOT REPLACE THE CONTRACT DOCUMENTS. ITEMS OMITTED OR SHOWN INCORRECTLY AND ARE NOT FLAGGED BY THE STRUCTURAL OR ARCHITECT SHALL NOT BE CONSIDERED CHANGES TO THE CONTRACT DOCUMENTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ITEMS ARE CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
6. THE ADEQUACY OF ENGINEERING DESIGNS AND LAYOUT PERFORMED BY OTHERS RESTS WITH THE DESIGNING OR SUBMITTING AUTHORITY.
7. REVIEWING IS INTENDED ONLY AS AN AID TO THE CONTRACTOR IN OBTAINING CORRECT SHOP DRAWINGS. RESPONSIBILITY FOR THE CORRECTNESS SHALL REST WITH THE CONTRACTOR.

# DEFERRED SUBMITTALS

DEFERRED SUBMITTAL LIST:
1. PRECAST WALL PANELS AND CONNECTIONS
2. COLD-FORMED FRAMING
3. STEEL JOISTS
4. METAL PLATE WOOD TRUSSES
5. HEAVY TIMBER TRUSSES AND CONNECTIONS
6. GLULAM FRAMING
7. PREFABRICATED BALCONIES
8. PREFABRICATED RAILINGS
9. CURTAIN WALL

NOTES:
1. ALL DEFERRED SUBMITTALS SHALL BE IN GENERAL CONFORMANCE WITH THE DESIGN OF THE BUILDING.
2. ALL DEFERRED SUBMITTALS SHALL BE SUBMITTED FOR REVIEW BY THE BUILDING OFFICIAL, ARCHITECT, AND STRUCTURAL ENGINEER, AND ITEMS SHALL NOT BE INSTALLED, ERECTED, OR FABRICATED UNTIL APPROVED.

# DESIGN INFORMATION

## BUILDING CODE

| CODE |
|---|
| INTERNATIONAL BUILDING CODE 2015 |

## GRAVITY SYSTEM

| ELEMENT | DEAD LOAD | LIVE LOAD |
|---|---|---|
| ROOF | 25 PSF | REFER TO SNOW LOAD |
| ELECTRICAL PLATFORM | 5 PSF | 125 PSF |

## SNOW CRITERIA

| CODE INFORMATION | DESIGN INFORMATION |
|---|---|
| DESIGN SNOW LOAD | 27 PSF PLUS DRIFT WHERE INDICATED |
| FLAT ROOF SNOW LOAD | 25.4 PSF |
| SNOW EXPOSURE FACTOR | Ce = 1.0 |
| SNOW IMPORTANCE FACTOR | Is = 1.1 |
| THERMAL FACTOR | Ct = 1.1, 1.2 AT OVERHANGS |
| GROUND SNOW | Pg = 30 PSF |
| RAIN ON SNOW SURCHAGE | 0 PSF |
| SLOPED ROOF FACTOR | Cs = 1.0 |

## WIND CRITERIA

| CODE INFORMATION | DESIGN INFORMATION |
|---|---|
| BASIC WIND SPEED (3 SECOND GUST) | 120 MPH (ULTIMATE) |
| WIND DIRECTIONALITY FACTOR | Kd = 0.85 |
| MEAN ROOF HEIGHT | 20.5 FT |
| WIND IMPORTANCE FACTOR | Iw=1.0 |
| WIND OCCUPANCY CATEGORY | III |
| WIND EXPOSURE CATEGORY | C |
| INTERNAL PRESSURE COEFFICIENT | GCPi = +-0.18 |
| TOPOGRAPHIC FACTOR | Kzt = 1.0 |
| DESIGN PROCEDURE | SIMPLE DIAPHRAGM |

## ROOF SURFACE WIND PRESSURES ULTIMATE

| AREA | 10 SF | 50 SF | 100 SF |
|---|---|---|---|
| NEGATIVE ZONE 1 | -33.5 PSF | -31.5 PSF | -30.7 PSF |
| NEGATIVE ZONE 2 | -56.2 PSF | -42.3 PSF | -36.4 PSF |
| NEGATIVE ZONE 3 | -84.7 PSF | -50.8 PSF | -36.4 PSF |
| POSITIVE ZONE ALL ZONES | 16.0 PSF | 16.0 PSF | 16.0 PSF |
| OVERHANG ZONE 1 AND 2 | -48.3 PSF | -46.3 PSF | -45.5 PSF |
| OVERHANG ZONE 3 | -79.5 PSF | -39.8 PSF | -22.7 PSF |

## WALL SURFACE WIND PRESSURES ULTIMATE

| AREA | 10 SF | 100 SF | 500 SF |
|---|---|---|---|
| NEGATIVE ZONE 4 | -33.2 PSF | -28.7 PSF | -25.6 PSF |
| NEGATIVE ZONE 5 | -40.9 PSF | -31.9 PSF | -25.6 PSF |
| POSTIVE ZONE 4 AND 5 | 30.7 PSF | 26.2 PSF | 23.0 PSF |

## SEISMIC CRITERIA

| CODE INFORMATION | DESIGN INFORMATION |
|---|---|
| SEISMIC IMPORTANCE FACTOR | I - 1.25 |
| OCCUPANCY CATEGORY | III |
| MAPPED SPECTRAL RESPONSE ACCELERATION (SHORT) | Ss = 8.70%g |
| MAPPED SPECTRAL RESPONSE ACCELERATION (LONG) | S1 = 4.60%g |
| SITE CLASS | D |
| SPECTRAL RESPONSE COEFFICIENT (SHORT) | SDS = 0.093 |
| SPECTRAL RESPONSE COEFFICIENT (LONG) | SD1 = 0.074 |
| SEISMIC DESIGN CATEGORY | B |
| BASIC SEISMIC FORCE RESISTING SYSTEM | STRUCTURAL STEEL SYSTEMS NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE |
| DESIGN BASE SHEAR | 0.039W |
| SEISMIC RESPONSE COEFFICIENT | Cs = 0.039 |
| RESPONSE MODIFICATION FACTOR | 3 |
| ANALYSIS PROCEDURE | EQUIVALENT LATERAL FORCE ANALYSIS |

## GEOTECHNICAL CRITERIA

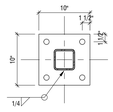
| INFORMATION | DESIGN INFORMATION |
|---|---|
| SOIL UNIT WEIGHT | 145 PCF (ASSUMED) |
| ACTIVE EARTH PRESSURE (MOVEMENT) | 35 PSF/FT (ASSUMED) |
| AT-REST PRESSURE (BRACED) | 50 PSF/FT (ASSUMED) |
| PASSIVE PRESSURE | 300 PSF (ASSUMED) |
| COEFFICIENT OF SLIDING FRICTION | 0.35 (ASSUMED) |
| SUBGRADE MODULUS | 150 PCI (ASSUMED) |
| ALLOWABLE NET BEARING PRESSURE | 3,000 PSF (ASSUMED) |
| REPORT | BASED ON REPORT NUMBER XXX PREPARED BY XXX FOR DESCRIPTION OF SOILS |

# STEEL DESIGN STRENGTHS

| MATERIAL | STRENGTH |
|---|---|
| REINFORCING STEEL: | |
| ASTM A615, DEFORMED | Fy = 60 ksi |
| ASTM A706, LOW ALLOY, WELDABLE | Fy = 60 ksi |
| ASTM A1064, WELDED WIRE REINFORCEMENT | Fy = 65 ksi |
| | |
| STRUCTURAL STEEL: | |
| WIDE FLANGE, ASTM A992 | Fy = 50 ksi |
| CHANNELS, ANGLES, S SHAPES, ASTM A36 | Fy = 36 ksi |
| PLATE AND BAR STOCK, ASTM A36 | Fy = 36 ksi |
| RECT HSS MEMBERS, ASTM A500, GRADE B | Fy = 46 ksi |
| PIPES, ASTM A53, GRADE B | Fy = 35 ksi |
| | |
| COLD-FORMED STEEL: | |
| 18 GAUGE AND THINNER | Fy = 33 ksi |
| 16 GAUGE AND THICKER | Fy = 50 ksi |
| METALLIC COATING DESIGNATION | G90 |
| | |
| CONNECTIONS: | |
| BOLTS (PLAIN AND GALVANIZED) | ASTM A325 |
| NUTS | ASTM A563 |
| WASHERS | ASTM F436 |
| TWIST-OFF TENSION CONTROL BOLTS | ASTM F1852 |
| COMPRESSIBLE WASHER TYPE DIRECT TENSION | ASTM F959 |
| ANCHOR RODS (GRADE SPECIFIED ON PLANS) | ASTM F1554 |
| THREADED RODS | ASTM A36 |
| SHEAR STUD CONNECTORS | ASTM A29 |
| CLEVISES AND TURNBUCKLES | AISI C-1035 |
| STEEL EYE NUTS AND STEEL EYE BOLTS | AISI C-1030 |
| SLEEVE NUTS | AISI C-1018, GR 2 |
| | |
| FILLER METAL FOR WELDS, ANSI/AWS D1.1 | E70xx |
| FILLER METAL FOR REINFORCING BARS | E80xx |
| | |
| NON-METALLIC, NON-SHRINK GROUT | ASTM C1107 |

# COLUMN BASE PLATE SCHEDULE

NOTES:
1. REFER TO PLAN FOR TOP OF CONCRETE ELEVATIONS.
2. PROVIDE ANCHOR RODS WITH NUT/WASHER ABOVE BASE PLATE AND LEVELING NUT/WASHER BELOW BASE PLATE. TACK WELD A NUT TO THE ROD END, AT FABRICATOR'S OPTION, SETTING PLATE MAY BE USED.
3. PROVIDE GROUT BED CONSISTING ON NON-SHRINK, NON-METALLIC GROUT. GROUT TO HAVE MINIMUM COMPRESSIVE STRENGTH OF 8,000 PSI. PROVIDE GROUT HOLES IN THE BASE PLATE AS NECESSARY.
4. BASE PLATES SHALL BE FINISHED IN ACCORDANCE WITH AISC 360, CHAPTER M.
5. COLUMN BASES SHALL BE SET LEVEL AND TO CORRECT ELEVATION WITH FULL BEARING ON CONCRETE OR MASONRY.




1/2" BASE PLATE WITH (4) 5/8" DIA x 4" SMPS/ON TITEN HD.

BP1

# CONCRETE DESIGN STRENGTHS

| ELEMENT | CONCRETE STRENGTH | MAX AGGREGATE | MAX w/c RATIO | AIR CONTENT | SLUMP |
|---|---|---|---|---|---|
| FOOTINGS | 3,000 PSI | 1-1/2" | 0.59 | NONE | 5" |

# SHEET INDEX


| | |
|---|---|
| S001 | GENERAL STRUCTURAL NOTES |
| S100 | FLOOR FRAMING PLAN |
| S110 | ROOF FRAMING PLAN |
| S400 | STRUCTURAL DETAILS |


WISCONSIN PATRICK D. REYNOLDS E-36645 WAUWATOSA WI PROFESSIONAL ENGINEER

Revisions


REYN ENGINEERING
131 W. SEEBOTH, SUITE 220
MILWAUKEE, WI 53204
REYN PROJECT NO: 23195


CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
GENERAL STRUCTURAL NOTES

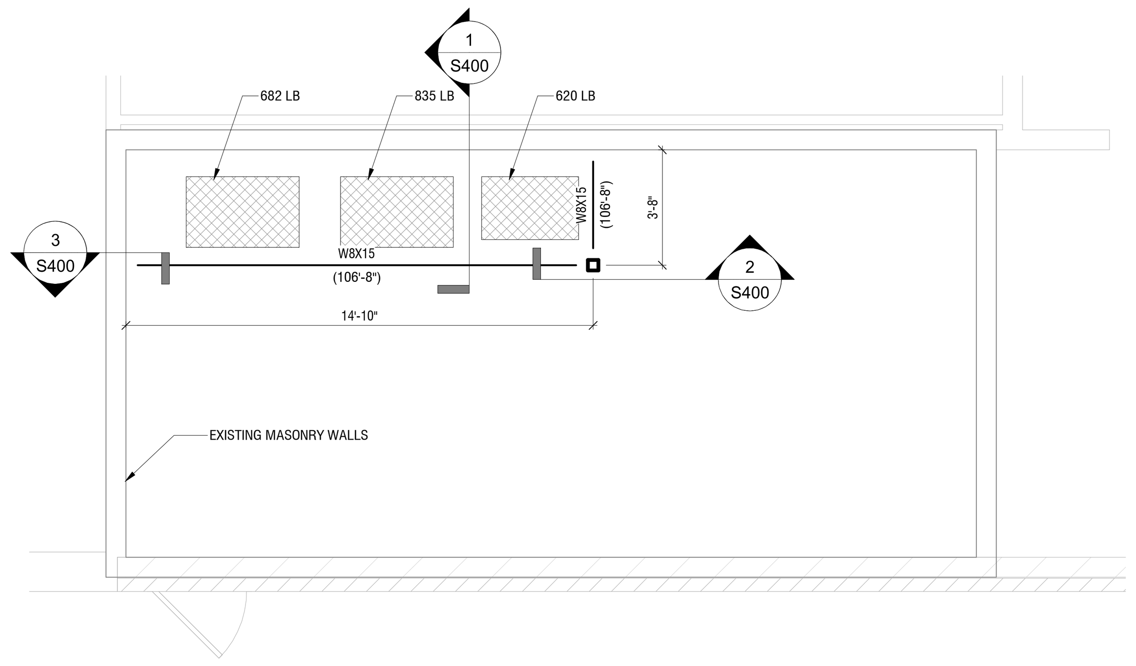
NORTH


790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

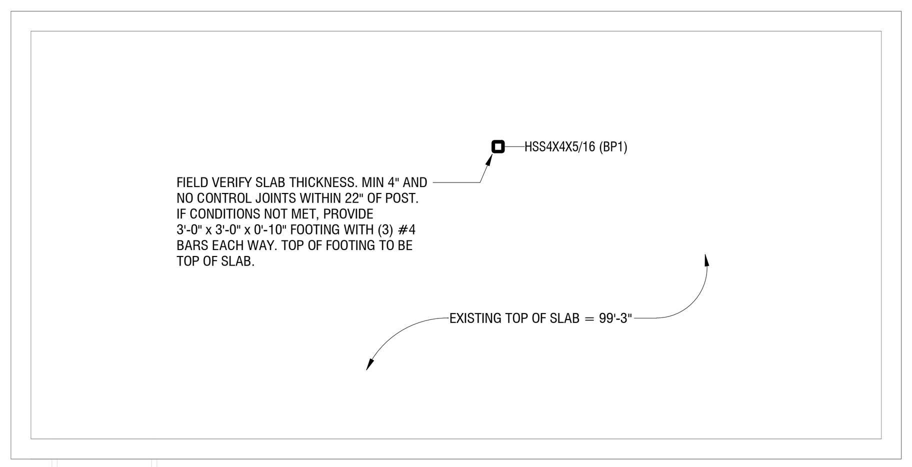

Sheet No.
S001

12/21/2023 9:45:48 PM

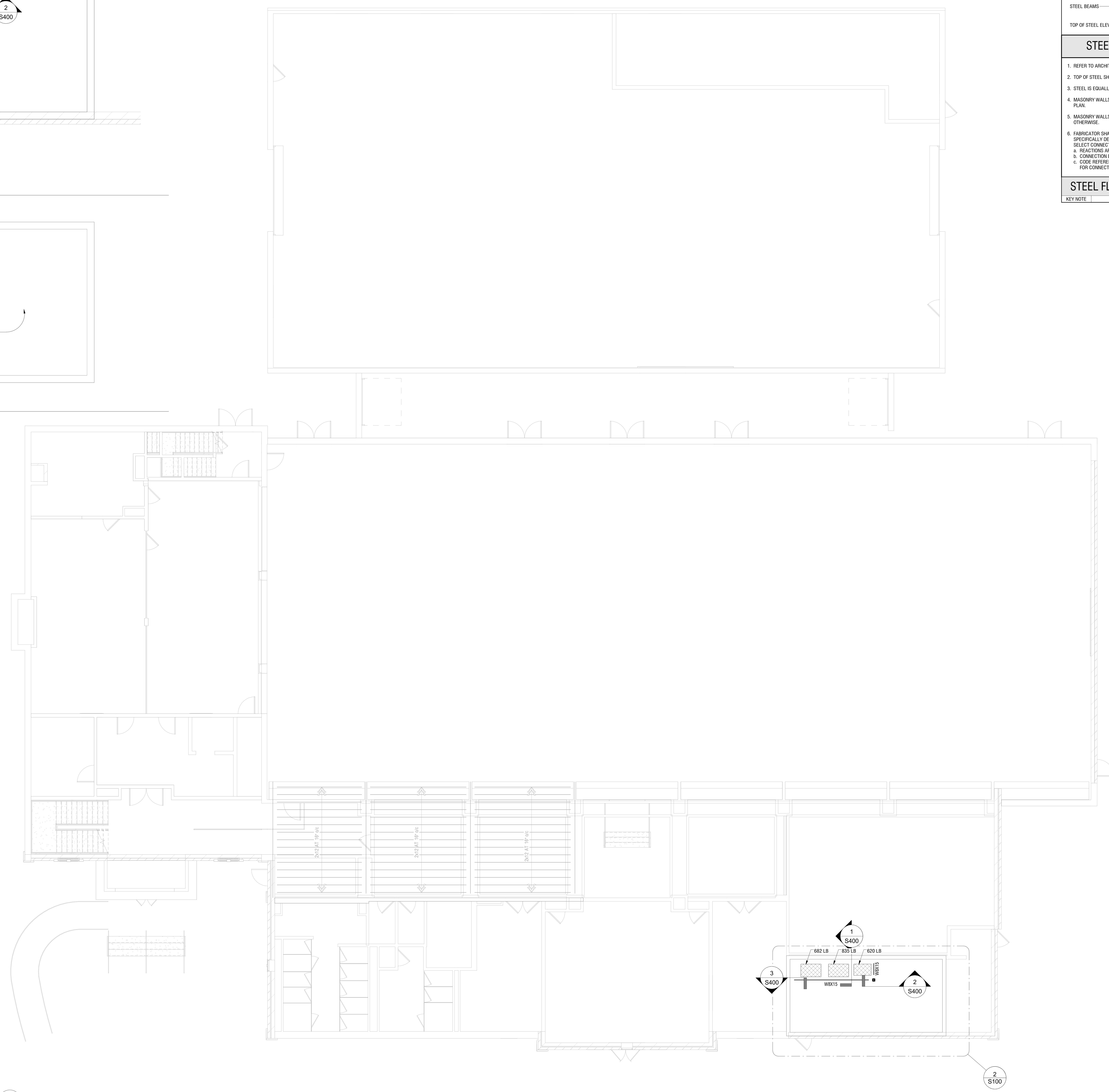
Kahler Slater




2 S100 ENLARGED ELECTRICAL ROOM FRAMING PLAN
1/4" = 1'-0"




3 S100 ENLARGED ELECTRICAL ROOM FOUNDATION PLAN
1/4" = 1'-0"




1 S100 2ND FLOOR FRAMING PLAN
1/8" = 1'-0"

## STEEL FLOOR FRAMING LEGEND



## STEEL FLOOR FRAMING PLAN NOTES

1. REFER TO ARCHITECTURAL PLANS FOR STAIR FRAMING, DIMENSIONS AND CONFIGURATION.
2. TOP OF STEEL SHALL BE AS NOTED ON PLANS.
3. STEEL IS EQUALLY SPACED BETWEEN MEMBERS UNLESS NOTED OTHERWISE.
4. MASONRY WALLS SHALL BE REINFORCED WITH #5 AT 48" o/c UNLESS NOTED OTHERWISE ON PLAN.
5. MASONRY WALLS SHALL BE GROUTED SOLID AT ANCHORAGE LOCATIONS, UNLESS NOTED OTHERWISE.
6. FABRICATOR SHALL SELECT SHEAR TAB OR DOUBLE ANGLED CONNECTIONS NOT SPECIFICALLY DETAILED. WHERE REACTIONS ARE SHOWN ON PLAN, FABRICATOR MAY SELECT CONNECTIONS BASED ON THE FOLLOWING INFORMATION:
   a. REACTIONS ARE UNFACTORED AND SERVICE LEVEL.
   b. CONNECTION DESIGN SHALL BE BASED ON ALLOWABLE STRENGTH DESIGN.
   c. CODE REFERENCED EDITION OF THE AISC STEEL CONSTRUCTION MANUAL SHALL BE USED FOR CONNECTION DESIGN.

## STEEL FLOOR FRAMING PLAN KEYED NOTES

| KEY NOTE | DESCRIPTION |
|---|---|

Revisions

REYN ENGINEERING
131 W. SEEBOTH, SUITE 220
MILWAUKEE, WI 53204
REYN PROJECT NO: 23195

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
FLOOR FRAMING PLAN

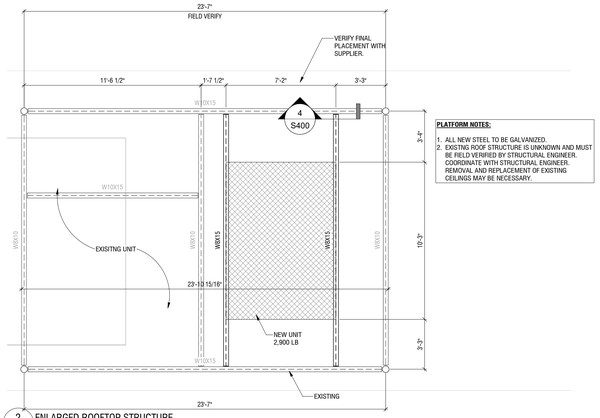
NORTH

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
S100

12/21/2023 9:45:52 PM

Kahler Slater

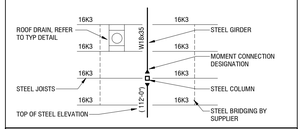



**PLATFORM NOTES:**

1. ALL NEW STEEL TO BE GALVANIZED.
2. EXISTING ROOF STRUCTURE IS UNKNOWN AND MUST BE FIELD VERIFIED BY STRUCTURAL ENGINEER. COORDINATE WITH STRUCTURAL ENGINEER. REMOVAL AND REPLACEMENT OF EXISTING CEILINGS MAY BE NECESSARY.

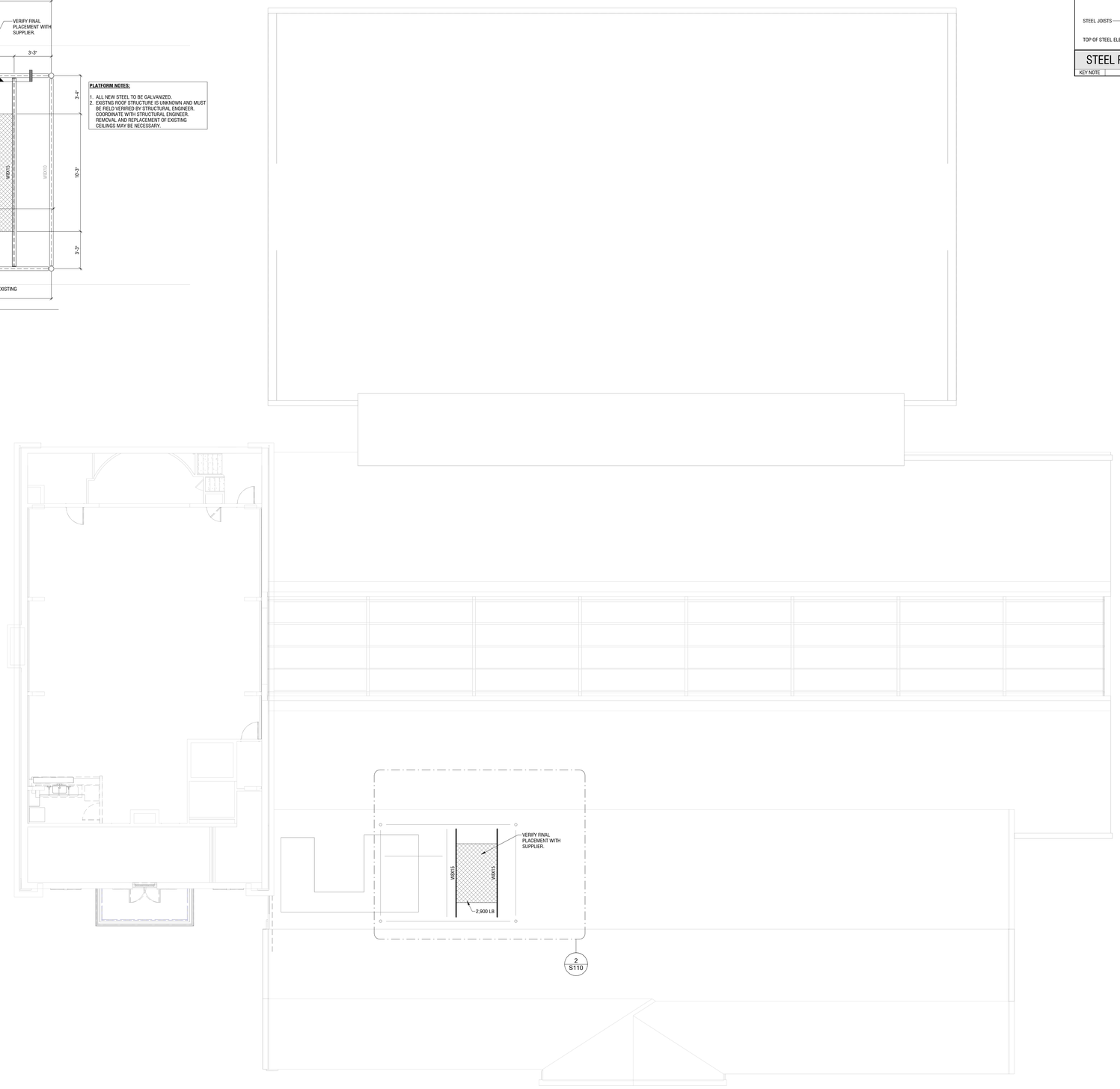
2 S110 ENLARGED ROOFTOP STRUCTURE
1/4" = 1'-0"

## STEEL ROOF FRAMING LEGEND




## STEEL ROOF FRAMING PLAN KEYED NOTES

| KEY NOTE | DESCRIPTION |
|---|---|




1 S110 03-ROOF FRAMING PLAN
1/8" = 1'-0"

Revisions

REYN ENGINEERING
131 W. SEEBOTH, SUITE 220
MILWAUKEE, WI 53204
REYN PROJECT NO: 23195

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

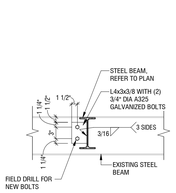
Sheet Title
ROOF FRAMING PLAN

NORTH

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

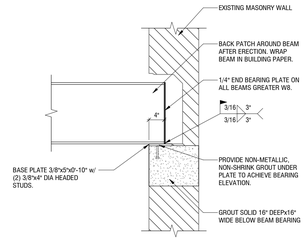
Sheet No.
S110

12/21/2023 9:45:55 PM

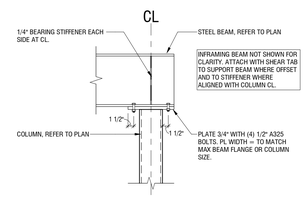



NOTES:
1. BOLTS ARE TO BE 3/4" DIA, A325, UNLESS NOTED OTHERWISE.
2. OTHER CONNECTIONS MAY BE SUBSTITUTED WITH ENGINEER'S PRIOR CONSENT.
3. SIZES AS SCHEDULED ARE MINIMUM. FABRICATOR MAY INCREASE AS NECESSARY.

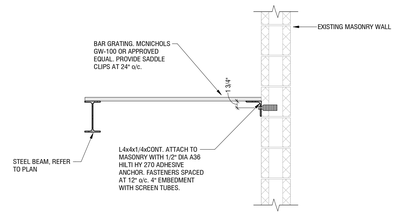
4 S400 BEAM TO BEAM CONNECTION AT ROOF STRUCTURE
3/4" = 1'-0"




3 S400 BEAM BEARING ON EXISTING MASONRY
3/4" = 1'-0"




2 S400 BEAM OVER COLUMN AT END
3/4" = 1'-0"




1 S400 SECTION AT ELECTRICAL ROOM PLATFORM
3/4" = 1'-0"

Revisions

REYN ENGINEERING
131 W. SEEBOTH, SUITE 220
MILWAUKEE, WI 53204
REYN PROJECT NO: 23195

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
STRUCTURAL DETAILS

NORTH

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
S400

12/21/2023 9:43:56 PM

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

## FIRE PROTECTION SYMBOLS:

- DP/SP — DRY PIPE SPRINKLER SYSTEM
- ITD — INSPECTORS TEST DRAIN
- PA/SP — PRE-ACTION SPRINKLER SYSTEM
- SP — WET PIPE SPRINKLER SYSTEM
- FDC — FIRE DEPARTMENT CONNECTION
- CONCEALED SPRINKLER HEAD
- PENDENT SPRINKLER HEAD
- PENDENT HEAD W/ CAGE
- PENDENT DRY SPRINKLER HEAD
- PENDENT HIGH TEMP
- SIDEWALL SPRINKLER HEAD
- SIDEWALL CONCEALED HEAD
- UPRIGHT SPRINKLER HEAD
- 48/18 SA — OBSTRUCTION FROM DUCTWORK 48" AND GREATER
- CHECK VALVE
- ALARM CHECK VALVE
- TAMPER DETECTION VALVE
- DRY PIPE VALVE
- INDICATING BUTTERFLY VALVE
- POST INDICATOR VALVE
- VALVE NONRISING STEM
- OS&Y VALVE
- PREACTION VALVE
- RISER
- DOUBLE CHECK (OS&Y)
- DOUBLE CHECK (BUTTERFLY W/ TAMPER)
- REDUCED PRESSURE ZONE
- X — EQUIPMENT TAG
- FDC FREE STANDING
- HORN/STROBE
- FIRE DEPARTMENT CONNECTION

## SPRINKLER HEAD SCHEDULE

| STYLE | LINKAGE TYPE | FINISH | QUICK RESPONSE | STANDARD RESPONSE | EXTENDED COVERAGE | MIN. TEMP. RATING (°F) | MISC. REQUIRED | AREA(S) TO BE INSTALLED |
|---|---|---|---|---|---|---|---|---|
| RECESSED PENDENT | GLASS | 1 | ● | ○ | ○ | 155 | RECESSED ESCUTCHEON TO MATCH FINISH | CONDITIONED SPACES WITH FINISHED CEILING |
| RECESSED DRY PENDENT | GLASS | 1 | ● | ○ | ○ | 155 | RECESSED ESCUTCHEON TO MATCH FINISH | UNCONDITIONED SPACES WITH FINISHED CEILING |
| UPRIGHT/ PENDENT | GLASS | 2 | ● | ○ | ○ | 155 | - | AREAS WITHOUT CEILINGS |
| HORIZONTAL SIDEWALL | GLASS | 2 | ● | ○ | ○ | 155 | - | TOSA ROOM |

FINISHES
1. CHROME PLATE
2. BRASS
3. WHITE
4. BLACK
5. OTHER:

○ NOT APPLICABLE
● APPLICABLE

## SYSTEM DESIGN SCHEDULE

| HAZARD CLASSIFICATION | DENSITY/AREA | SPACING MAX. HD. | HOSE DEMAND | OCCUPANCY |
|---|---|---|---|---|
| LIGHT | 0.10 GPM/1500 S.F. | 225 S.F | 100 GPM | OFFICES<br>PUBLIC AREAS<br>LOCKER ROOMS<br>STAFF WORK AREAS |
| ORDINARY/GROUP 1 | 0.15 GPM/1500 S.F. | 130 S.F | 250 GPM | EQUIPMENT ROOM WITHOUT GAS FIRED EQUIPMENT<br>STORAGE UP TO 8 FEET<br>JANITOR CLOSETS<br>ELEVATOR EQUIPMENT<br>ELECTRICAL EQUIPMENT<br>COMMUNICATION EQUIPMENT<br>LARGE OPEN AREAS |
| ORDINARY/GROUP 2 | 0.20 GPM/1500 S.F. | 130 S.F. | 250 GPM | STORAGE, UP TO 12 FEET<br>SHOP AREAS<br>EQUIPMENT ROOM WITH GAS FIRED EQUIPMENT |

## FIRE PROTECTION GENERAL NOTES

1. FIELD VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WORK.
2. REFER TO PROJECT MANUAL FOR SPECIFICATIONS AND CONTRACT REQUIREMENTS.
3. REFER TO ARCHITECTURAL DRAWINGS FOR THE NEW CEILING WORK. REFERENCE THE MECHANICAL AND ELECTRICAL DRAWINGS FOR LIGHTS, GRILLES, ETC.
4. PROPER PRECAUTION SHALL BE TAKEN TO KEEP THE BUILDING CLEAN OF DUST, DIRT, AND CONSTRUCTION DEBRIS.
5. MODIFY EXISTING PIPING AS REQUIRED FOR NEW SPRINKLER HEAD LOCATIONS WITHIN RENOVATION AREAS.
6. FIRE PROTECTION SYSTEMS LOCATED OUTSIDE OF THE CURRENT CONSTRUCTION PHASE OR AREA SHALL BE OPERATIONAL AT THE END OF EACH WORK DAY, UNLESS APPROVED BY THE OWNERS REPRESENTATIVE.
7. MODIFY EXISTING PIPING AS REQUIRED TO COORDINATE WITH WORK OF OTHER CONTRACT DIVISIONS.
8. VERIFY EXISTING FIRE PROTECTION PIPING LOCATIONS, SIZES, AND HYDRAULIC FLOW DATA AS REQUIRED FOR SCOPE OF WORK.
9. COMPLY WITH NFPA 13 FOR COVERAGE AND DENSITY, UNLESS INDICATED OTHERWISE IN THE SYSTEM DESIGN SCHEDULE ON THE DRAWINGS.
10. FIRE STOPPING SHALL COMPLY WITH THE REQUIREMENTS OF THE SPECIFICATIONS.
11. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES, SIZES, CAPACITIES, ACCESSORIES, SEQUENCES, MATERIALS, MEANS AND METHODS, PERFORMANCE, FABRICATION PROCESSES, AND TECHNIQUES OF CONSTRUCTION. THE CONTRACTOR SHALL COORDINATE ALL WORK WITH THAT OF OTHER TRADES. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DESIGN/BUILD CHANGES, EQUIPMENT SUBSTITUTIONS, AND VALUE ENGINEERING CHANGES PERFORMED BY THE CONTRACTOR.
12. SEAL ALL PIPING PENETRATIONS AIR TIGHT THRU WALLS, FLOORS, OR PARTITIONS IDENTIFIED AS SOUND WALLS, SMOKE TIGHT WALLS, FIRE BARRIERS, SMOKE BARRIERS, SHAFTS OR FIRE RATED CONSTRUCTION INDICATED ON THE ARCHITECTURAL LIFE SAFETY DRAWINGS. MAINTAIN ALL DESIGNATED FIRE RATINGS, SMOKE RATINGS AND UL LISTINGS.
13. FINAL PRODUCT SHALL BE A COMPLETE AND FUNCTIONING SYSTEM, AND SHALL CONFORM TO ALL REQUIREMENTS OF APPLICABLE CODES.
14. INSTALL ALL EQUIPMENT IN ACCORDANCE WITH THE RESPECTIVE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS, AT A LEVEL OF QUALITY AND WORKMANSHIP CONSISTENT WITH THE SPECIFICATIONS.
15. PRIOR TO STARTING WORK, SUBMIT SHOP DRAWINGS FOR ALL FIRE PROTECTION EQUIPMENT AND SPRINKLERS.
16. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND SHALL ARRANGE FOR ALL INSPECTIONS AS REQUIRED.

## FIRE PROTECTION DEMOLITION NOTES:

1. INFORMATION PERTAINING TO EXISTING PROJECT CONDITIONS,SUCH AS PRESENT LOCATIONS OF ARCHITECTURAL AND STRUCTURAL BUILDING COMPONENTS, MECHANICAL AND ELECTRICAL EQUIPMENT, PIPING, DUCTWORK, ROUGH-INS AND OTHER MISCELLANEOUS CONSTRUCTION APPEARS ON THE DRAWINGS. WHILE SUCH INFORMATION HAS BEEN BASED ON AVAILABLE RECORDS AND COLLECTED WITH REASONABLE CARE, THE ARCHITECT AND ENGINEER DOES NOT ASSUME ANY EXPRESSED OR IMPLIED GUARANTEE THAT CONDITIONS SO INDICATED ARE SHOWN ENTIRELY COMPLETE, CORRECT AND REPRESENTATIVE OF THOSE ACTUALLY EXISTING. ALL CONTRACTORS SHALL SATISFY THEMSELVES AS TO ALL EXISTING JOB CONDITIONS PRIOR TO BIDDING, AND VERIFY ALL DIMENSIONS AT THE SITE.
2. ALL EXISTING FIRE PROTECTION SHOWN HATCHED AND/OR DESIGNATED WITH AN "X" SHALL BE REMOVED. ALL FIRE PROTECTION NOT INDICATED TO BE REMOVED SHALL REMAIN.
3. EXISTING PIPING SHALL BE REMOVED BACK TO PIPING TO REMAIN. EXISTING PIPING SHALL NOT BE ABANDONED IN PLACE UNLESS APPROVED BY THE ENGINEER AND OWNER'S REPRESENTATIVE.
4. REFER TO THE SPECIFICATIONS FOR CUTTING AND PATCHING REQUIREMENTS.
5. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING NECESSARY FOR THE WORK OF THIS CONTRACT UNLESS SPECIFICALLY INDICATED OTHERWISE WITHIN THE ARCHITECTURAL DRAWINGS OR SPECIFICATIONS.
6. SEAL ALL EXISTING PIPE PENETRATIONS IN EXISTING CONSTRUCTION WHERE PIPING IS REMOVED. SEALED PENETRATIONS SHALL MATCH RATING OF THE CONSTRUCTION IN WHICH THEY OCCUR.
7. FIRE PROTECTION CONTRACTOR SHALL REMOVE, AND REINSTALL OR REPLACE, EXISTING CEILINGS AS REQUIRED FOR ACCESS TO FIRE PROTECTION SYSTEMS. THIS INCLUDES AREAS OUTSIDE THE PROJECT CONSTRUCTION LIMITS.
8. WHERE EXISTING PIPING IS REMOVED, REMAINING PIPING SHALL BE CAPPED BELOW FINISHED FLOORS, WITHIN WALLS AND ABOVE SUSPENDED CEILINGS.

## FIRE PROTECTION SYSTEM DESCRIPTION:

1. FIRE PROTECTION CONTRACTOR SHALL REMODEL THE EXISTING DRY SPRINKLER SYSTEM IN ACCORDANCE TO THE CONTRACT SCOPE DOCUMENTS, THE LATEST EDITIONS OF NFPA 13, AND THE LOCAL AHJ.
2. THIS PROJECT IS A SINGLE PHASE PROJECT.
3. THE FIRE PROTECTION CONTRACTOR SHALL DO TESTING ON EXISTING DRY SPRINKLER PIPING TO DETERMINE THE CONDITION OF THE PIPING DUE TO CORROSION. TESTING SHALL BE DONE IN ALL AREAS OF EXISTING PIPING TO DETERMINE THE OVERALL SCOPE OF REPLACING EXISTING PIPING. RESULTS OF TESTING, RECOMMENDATIONS AND BUDGET FOR PIPE REPLACEMENT SHALL BE SHARED WITH THE OWNER, ARCHITECT, ENGINEER AND CM TO DETERMINE EXTEND OF WORK APPROVED FOR THIS PROJECT.

## FIRE PROTECTION SHEET INDEX

FP000 FIRE PROTECTION TITLE SHEET
FPD201 FIRST FLOOR FIRE PROTECTION DEMOLITION PLAN
FP201 FIRST FLOOR FIRE PROTECTION PLAN

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
FIRE PROTECTION TITLE SHEET

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
FP000

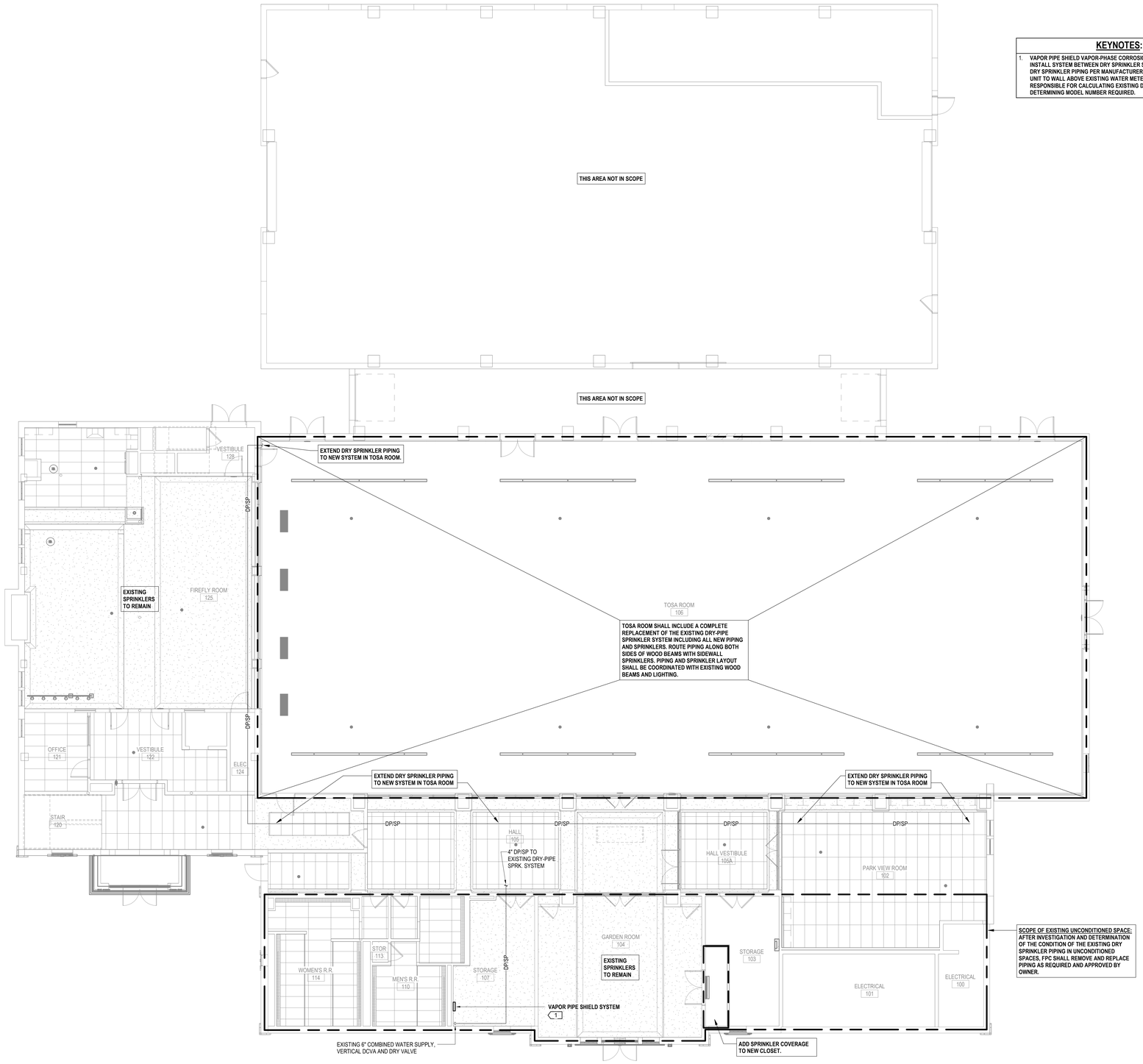
01/05/2023 3:01:12 PM

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00

## KEYNOTES:

1. VAPOR PIPE SHIELD VAPOR-PHASE CORROSION INHIBITOR (VpCI) SYSTEM. INSTALL SYSTEM BETWEEN DRY SPRINKLER SYSTEM AIR COMPRESSOR AND DRY SPRINKLER PIPING PER MANUFACTURERS RECOMMENDATIONS. MOUNT UNIT TO WALL ABOVE EXISTING WATER METER AND PIPING. FPC SHALL BE RESPONSIBLE FOR CALCULATING EXISTING DRY SYSTEM CAPACITY AND DETERMINING MODEL NUMBER REQUIRED.




1 FIRST FLOOR FIRE PROTECTION PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

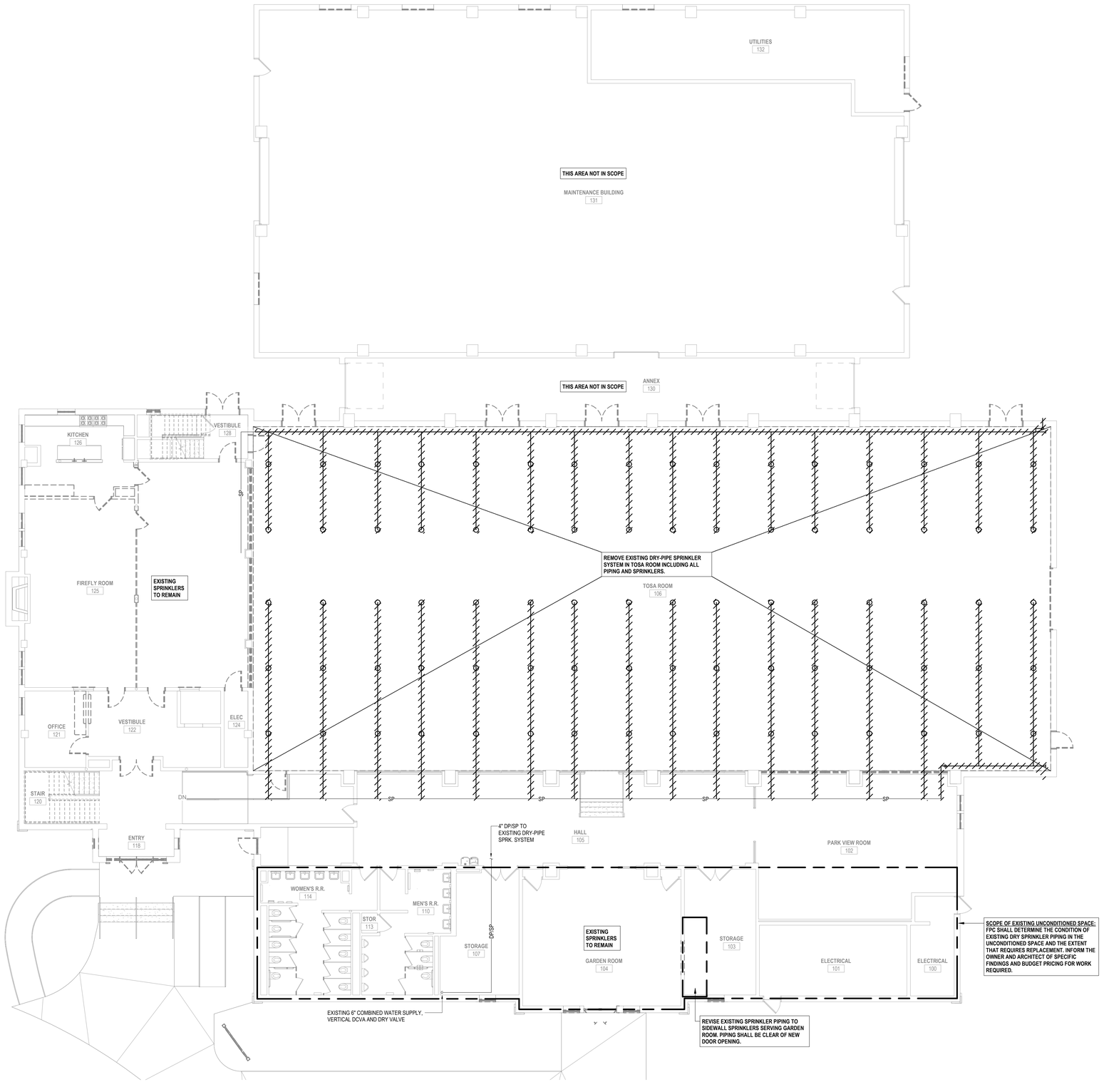
Sheet Title
FIRST FLOOR FIRE PROTECTION PLAN

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
FP201

01/05/2024 2:01:18 PM




1 FIRST FLOOR FIRE PROTECTION DEMOLITION PLAN
1/8" = 1'-0"


Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 / Fax: 414.778.2360 / r-d@ringdu.com
RD Project Number: 223003.00


Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
FIRST FLOOR FIRE PROTECTION DEMOLITION PLAN


Copyright © 2020 Kahler Slater, Inc. All rights reserved.



790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001


Sheet No.
FPD201

12/19/2023 2:16:29 PM

## PLUMBING DEMOLITION NOTES

1. INFORMATION PERTAINING TO EXISTING PROJECT CONDITIONS, SUCH AS PRESENT LOCATIONS OF ARCHITECTURAL AND STRUCTURAL BUILDING COMPONENTS, MECHANICAL AND ELECTRICAL EQUIPMENT, PIPING, DUCTWORK, ROUGH-INS AND OTHER MISCELLANEOUS CONSTRUCTION APPEARS ON THE DRAWINGS. WHILE SUCH INFORMATION HAS BEEN BASED ON AVAILABLE RECORDS AND COLLECTED WITH REASONABLE CARE. THE ARCHITECT AND ENGINEER DOES NOT ASSUME ANY EXPRESSED OR IMPLIED GUARANTEE THAT CONDITIONS SO INDICATED ARE SHOWN ENTIRELY COMPLETE, CORRECT AND REPRESENTATIVE OF THOSE ACTUALLY EXISTING. ALL CONTRACTORS SHALL SATISFY THEMSELVES AS TO ALL EXISTING JOB CONDITIONS PRIOR TO BIDDING, AND VERIFY ALL DIMENSIONS AT THE SITE.
2. ALL EXISTING PLUMBING SHOWN HATCHED AND/OR DESIGNATED WITH AN "X" SHALL BE REMOVED. ALL PLUMBING NOT INDICATED TO BE REMOVED SHALL REMAIN.
3. WHERE EXISTING PIPING IS TO BE REMOVED AT A SLAB ON GRADE, CAP EXISTING PIPING FLUSH OR BELOW FLOOR LEVEL SO AS NOT TO INTERFERE WITH NEW FLOOR FINISHES. EXISTING PIPING SHALL NOT BE ABANDONED IN PLACE UNLESS APPROVED BY THE ENGINEER AND OWNER'S REPRESENTATIVE.
4. EXISTING PIPING SHALL BE REMOVED BACK TO PIPING TO PIPING TO REMAIN. EXISTING PIPING SHALL NOT BE ABANDONED IN PLACE UNLESS APPROVED BY THE ENGINEER AND OWNER'S REPRESENTATIVE.
5. REPAIR PIPE INSULATION ON EXISTING PIPING WHERE DAMAGED BY DEMOLITION OR NEW WORK.
6. REFER TO THE SPECIFICATIONS FOR CUTTING AND PATCHING REQUIREMENTS.
7. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING NECESSARY FOR THE WORK OF THIS CONTRACT UNLESS SPECIFICALLY INDICATED OTHERWISE WITHIN THE ARCHITECTURAL DRAWINGS OR SPECIFICATIONS.
8. SEAL ALL EXISTING PIPE PENETRATIONS IN EXISTING CONSTRUCTION WHERE PIPING IS REMOVED. SEALED PENETRATIONS SHALL MATCH RATING OF THE CONSTRUCTION IN WHICH THEY OCCUR.
9. PLUMBING CONTRACTOR SHALL REMOVE, AND REINSTALL OR REPLACE, EXISTING CEILINGS AS REQUIRED FOR ACCESS TO PLUMBING SYSTEMS. THIS INCLUDES, CEILINGS ON THE FLOORS BELOW THE PROJECT AREA AND AREAS OUTSIDE THE PROJECT CONSTRUCTION LIMITS.
10. WHERE EXISTING PIPING IS REMOVED, REMAINING PIPING SHALL BE CAPPED BELOW FINISHED FLOORS, WITHIN WALLS AND ABOVE SUSPENDED CEILINGS.
11. CONTRACTOR SHALL VISIT JOB SITE AND BECOME FAMILIAR WITH EXISTING CONDITIONS PRIOR TO STARTING WORK.
12. SAWCUT AND PATCH FLOOR SLAB AS REQUIRED FOR ALL DEMOLITION AND NEW WORK. COORDINATE WITH THE OWNER AND CONSTRUCTION MANAGER. FIELD VERIFY ALL PIPE SIZES, LOCATIONS AND INVERT ELEVATIONS.
13. WHERE FLOOR DRAINS OCCUR WITHIN THE LIMITS OF CONSTRUCTION, PREVENT CONSTRUCTION DEBRIS FROM ENTERING DRAIN BODY BY SEALING DRAIN OPENING PRIOR TO START OF WORK. UNSEAL DRAINS AT COMPLETION OF CONSTRUCTION.

## GENERAL PLUMBING NOTES

1. FIELD VERIFY EXISTING CONDITIONS PRIOR TO BEGINNING WORK.
2. REFER TO PROJECT MANUAL FOR SPECIFICATIONS AND OTHER CONTRACT REQUIREMENTS.
3. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES, SIZES, CAPACITIES, ACCESSORIES, SEQUENCES, MATERIALS, MEANS AND METHODS, PERFORMANCE, FABRICATION PROCESSES, AND TECHNIQUES OF CONSTRUCTION. THE CONTRACTOR SHALL COORDINATE ALL WORK WITH THAT OF OTHER TRADES. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DESIGN/BUILD CHANGES, EQUIPMENT SUBSTITUTIONS, AND VALUE ENGINEERING CHANGES PERFORMED BY THE CONTRACTOR.
4. DO NOT SCALE DRAWINGS FOR DRAIN LOCATIONS NEAR OR SERVING EQUIPMENT. OBTAIN EQUIPMENT PAD LOCATIONS AND EQUIPMENT CONNECTION REQUIREMENTS FROM OTHER CONTRACT DIVISIONS PRIOR TO LOCATING DRAINS.
5. SEAL ALL PIPING PENETRATIONS AIR TIGHT THRU WALLS, FLOORS, OR PARTITIONS IDENTIFIED AS SOUND WALLS, SMOKE TIGHT WALLS, FIRE BARRIERS, SMOKE BARRIERS, SHAFTS OR FIRE RATED CONSTRUCTION INDICATED ON THE ARCHITECTURAL LIFE SAFETY DRAWINGS. MAINTAIN ALL DESIGNATED FIRE RATINGS, SMOKE RATINGS AND UL LISTINGS.
6. INSTALL ALL SHUTOFF VALVES, CONTROL VALVES, DRAIN VALVES, AIR VENTS, AND ACCESSORIES IN ACCESSIBLE LOCATIONS. DEVICES LOCATED ABOVE CEILINGS SHALL BE INSTALLED WITHIN 3 FEET ABOVE THE CEILING TO MAINTAIN ACCESSIBILITY.
7. PROVIDE VALVE HANDLE EXTENSIONS FOR ALL VALVES SERVING INSULATED PIPING EXCEEDING 1" THICK.
8. EXPOSED PIPING IN OCCUPIED ROOMS WITH SUSPENDED CEILINGS IS PROHIBITED. IN ROOMS WITH WITHOUT CEILINGS, INSTALL EXPOSED PIPING AS HIGH AS PRACTICAL.
9. PRIOR TO MAKING ANY NEW PLUMBING FLOOR PENETRATIONS IN EXISTING BUILDINGS, X-RAY THE EXISTING CONSTRUCTION TO AVOID INTERFERENCES WITH STEEL REINFORCEMENT. COORDINATE WITH THE GENERAL CONTRACTOR.
10. AREAS OF THE BUILDING UTILIZING THE SPACE ABOVE SUSPENDED CEILINGS AND MECHANICAL EQUIPMENT ROOMS AS RETURN AIR PLENUMS SHALL COMPLY WITH NFPA 90A FOR ALLOWABLE MATERIALS WITHIN PLENUMS.
11. DESIGN OF ALL PLUMBING EQUIPMENT SUPPORTS SHALL BE THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR.
12. POWDER-ACTUATED ANCHORS ARE PROHIBITED.
13. RING AND CLEVIS PIPE HANGERS SHALL BE OVERSIZED TO ACCOMMODATE THE OUTSIDE DIAMETER OF THE PIPE INSULATION.
14. ALL PIPE INSULATION ENDS SHALL BE SEALED AT THRU-WALL AND IN-WALL STUD FRAMING PENETRATIONS.
15. ALL NON-INSULATED PIPING WITHIN WALLS SHALL HAVE GROMMETS INSTALLED AT PENETRATIONS THRU WALL FRAMING.
16. LOCATE PLUMBING ROOF VENTS A MINIMUM OF 25FT FROM OUTSIDE AIR INTAKE LOUVERS.
17. FINAL PRODUCT SHALL BE A COMPLETE AND FUNCTIONING SYSTEM, AND SHALL CONFORM TO ALL REQUIREMENTS OF APPLICABLE CODES.
18. LOCATE PIPING MINIMUM 4 FEET AWAY FROM THE SPACE ABOVE ELECTRICAL PANELS, TRANSFORMERS AND OTHER ELECTRICAL EQUIPMENT.
19. PIPE SIZES SHOWN SHALL BE CONTINUED IN THE DIRECTION OF FLOW UNTIL ANOTHER SIZE IS SHOWN.
20. FOR EQUIPMENT CONNECTIONS AND PIPE SIZES NOT SHOWN ON THE PLANS, REFER TO DETAILS AND SCHEDULES.
21. INSTALL ALL EQUIPMENT IN ACCORDANCE WITH THE RESPECTIVE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS, AT A LEVEL OF QUALITY AND WORKMANSHIP CONSISTENT WITH THE SPECIFICATIONS.
22. LOCATIONS OF PIPING AND EQUIPMENT AS INDICATED ON THE DRAWING, ARE APPROXIMATE AND SUBJECT TO MINOR ADJUSTMENTS IN THE FIELD. WORK SHALL BE COORDINATED WITH ALL OTHER TRADES TO AVOID INTERFERENCE IN THE FIELD.
23. PRIOR TO STARTING WORK, SUBMIT SHOP DRAWINGS FOR ALL PLUMBING EQUIPMENT AND FIXTURES.
24. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND SHALL ARRANGE FOR ALL INSPECTIONS AS REQUIRED.
25. MINIMUM PITCH FOR SANITARY AND STORM PIPING SHALL COMPLY WITH APPLICABLE CODES, UNLESS A GREATER PITCH IS INDICATED ON DRAWINGS.

## PLUMBING SYMBOLS:

| Line label | Description |
|---|---|
| | COLD WATER |
| CHW | COLD HARD WATER |
| CSW | COLD SOFT WATER |
| | HOT WATER |
| 140° | HOT WATER 140° |
| | HOT WATER RETURN |
| 140° | HOT WATER RETURN 140° |
| NP | NON-POTABLE WATER |
| TW | TEMPERED WATER |
| DI | DEIONIZED WATER |
| DIR | DEIONIZED RETURN PIPING |
| RO | REVERSE OSMOSIS WATER |
| ROR | REVERSE OSMOSIS RETURN WATER |
| SAN | SANITARY WASTE |
| | SANITARY VENT |
| DT | DRAIN TILE |
| CLW | CLEARWATER WASTE |
| CLV | CLEARWATER VENT |
| ST | STORM DRAINAGE |
| OF | OVERFLOW STORM DRAINAGE |
| AW | ACID / CHEMICAL WASTE |
| AV | ACID / CHEMICAL VENT |
| GW | GREASE WASTE |
| G | NATURAL GAS |
| PD | PUMP DISCHARGE |
| CA | COMPRESSED AIR |
| LA | LABORATORY AIR PIPING |
| LV | LABORATORY VACUUM PIPING |

- WATER METER
- SOLENOID VALVE
- PRESSURE REDUCING VALVE
- CHECK VALVE
- BALANCING VALVE
- SHUT-OFF VALVE
- WATER HAMMER ARRESTER
- FLOW ARROW
- CAPPED CONNECTION
- PIPE CONTINUATION
- CLEANOUT
- UNION
- PIPING DOWN
- PIPING UP
- HOSE BIB
- FLOOR DRAIN
- FLOOR SINK
- SITE DRAIN
- FLOOR CLEANOUT
- VENT THRU ROOF
- ROOF DRAIN
- INLINE PUMP
- CONNECT TO EXISTING
- EQUIPMENT BY OTHERS
- THERMOMETER
- (#) KEYED NOTE

## WATER CALCULATION WORKSHEET

Information need for Water Distribution Sizing.

Using the following formula, find the pressure available for uniform loss (p.s.i./100' of pipe).

A = B - (C + D + E) x 100 / F

- A. 19 Pressure available for uniform loss (p.s.i./100' of pipe).
- B. 80 Available pressure after water meter. (See item 9, above)
- C. 30 Pressure needed at controlling fixture.
- D. 6.5 Difference in elevation between water meter and controlling fixture in 15 feet x .434 p.s.i./ft.
- E. 0 Pressure loss due to water softeners, water treatment devices, instantaneous water heaters and backflow preventers. Conventional water heaters usually do not have a pressure loss.
- F. 225 Developed length from water meter to controlling fixture in 150 feet x 1.5.

With pressure available for uniform loss, go to applicable table for distribution sizing.

## PLUMBING ABBREVIATIONS:

| | |
|---|---|
| ABV | ABOVE |
| AD | AREA DRAIN |
| ADB | ACID / CHEMICAL DILUTION BASIN |
| ADD | ADDENDUM |
| AFF | ABOVE FINISHED FLOOR |
| AFG | ABOVE FINISHED GRADE |
| ALT | ALTERNATE |
| AP | ACCESS PANEL |
| ARCH | ARCHITECT/ARCHITECTURAL |
| AV | ACID / CHEMICAL VENT |
| AVTR | ACID / CHEMICAL VENT THRU ROOF |
| AW | ACID / CHEMICAL WASTE |
| AWC | AUTOMATIC WASHER CONNECTION |
| BFF | BELOW FINISHED FLOOR |
| BFP | BACKFLOW PREVENTER |
| BLW | BELOW |
| BT | BATH TUB |
| BVA | BALANCING VALVE |
| CA | COMPRESSED AIR |
| CB | CATCH BASIN |
| CC | CAPPED CONNECTION |
| CFM | CUBIC FEET PER MINUTE |
| CHW | COLD HARD WATER |
| CKVA | CHECK VALVE |
| CLG | CEILING |
| CLV | CLEAR WATER VENT |
| CLVTR | CLEAR WATER VENT THRU ROOF |
| CLW | CLEAR WATER WASTE |
| CO | CLEAN OUT |
| COND | CONDUCTOR |
| CONN | CONNECTION |
| COTG | CLEAN OUT TO GRADE |
| CS | CUP SINK |
| CSS | CLINICAL SERVICE SINK |
| CSW | COLD SOFT WATER |
| CW | COLD WATER |
| DCP | DOMESTIC CIRCULATING PUMP |
| DF | DRINKING FOUNTAIN |
| DI | DEIONIZED WATER |
| DIA | DIAMETER |
| DN | DOWN |
| DR | DRAIN |
| DT | DRAIN TILE |
| DTCO | DRAIN TILE CLEANOUT |
| DTR | DRAIN TILE RECEIVER |
| EA | EACH |
| EC | ELECTRICAL CONTRACTOR |
| EEW | EMERGENCY EYE WASH |
| EL | ELEVATION |
| ELEC | ELECTRICAL |
| EQUIP | EQUIPMENT |
| ES | EMERGENCY SHOWER |
| ESEW | EMERGENCY SHOWER-EYE WASH |
| ET | EXPANSION TANK |
| EWC | ELECTRIC WATER COOLER |
| EWH | ELECTRIC WATER HEATER |
| EWT | ENTERING WATER TEMPERATURE |
| EX | EXISTING |
| F | DEGREES FAHRENHEIT |
| FCO | FLOOR CLEAN OUT |
| FD | FLOOR DRAIN |
| FDC | FIRE DEPARTMENT CONNECTION |
| FFE | FINISHED FLOOR ELEVATION |
| FH | FUME HOOD |
| FL | FLOOR |
| FS | FLOOR SINK |
| FT | FOOT / FEET |
| G | GAS |
| GAL | GALLON |
| GC | GENERAL CONTRACTOR |
| GCB | GARAGE CATCH BASIN |
| GF | GAS-FIRED |
| GLY | GLYCOL |
| GPM | GALLONS PER MINUTE |
| GT | GREASE TRAP |
| GW | GREASE WASTE |
| GWH | GAS WATER HEATER |
| HB | HOSE BIB |
| HP | HORSE POWER |
| HW | HOT WATER |
| HWR | HOT WATER RETURN |
| HYD | HYDRANT |
| ID | INDIRECT |
| IE | INVERT ELEVATION |
| IN | INCH |
| L/LAV | LAVATORY |
| LA | LAB AIR |
| LB | POUND |
| LB/HR | POUNDS PER HOUR |
| LP | LOW PRESSURE |
| LPG | LIQUEFIED PETROLEUM GAS |
| LS | LAB SINK |
| LT | LAUNDRY TRAY |
| LV | LAB VACUUM |
| LWT | LEAVING WATER TEMPERATURE |
| MAX | MAXIMUM |
| MB | MOP BASIN |
| MBH | ONE THOUSAND BTU PER HOUR |
| MC | MECHANICAL CONTRACTOR |
| MCF | ONE THOUSAND CUBIC FEET |
| MECH | MECHANICAL |
| MFR | MANUFACTURER |
| MH | MANHOLE |
| MIN | MINIMUM |
| MISC | MISCELLANEOUS |
| NC | NORMALLY CLOSED |
| NIC | NOT IN CONTRACT |
| NO | NORMALLY OPEN |
| NP | NON-POTABLE |
| NTS | NOT TO SCALE |
| O | OXYGEN |
| OF | OVERFLOW |
| OD | OVERFLOW ROOF DRAIN |
| PC | PLUMBING CONTRACTOR |
| PD | PUMP DISCHARGE |
| PG | PRESSURE GAUGE |
| PIV | POST INDICATOR VALVE |
| PLBG | PLUMBING |
| PRESS | PRESSURE |
| PRV | PRESSURE REDUCING VALVE |
| PSI | POUNDS PER SQUARE INCH |
| PSIG | POUNDS PER SQUARE INCH GAUGE |
| PW | PURE WATER |
| PWR | POWER |
| RD | ROOF DRAIN |
| REC | RECESSED |
| RED | REDUCER |
| RIO | ROUGH-IN ONLY |
| RM | ROOM |
| RO | REVERSE OSMOSIS |
| RPBP | REDUCED PRESSURE BACKFLOW PREVENTER |
| RPM | REVOLUTIONS PER MINUTE |
| RW | RAIN WATER |
| S/SK | SINK |
| SAN | SANITARY |
| SD | SITE DRAIN |
| SE | SEWAGE EJECTOR |
| SF | SQUARE FOOT |
| SH | SHOWER |
| SM | SURFACE MOUNT |
| SP | SUMP PUMP |
| SS | SERVICE SINK |
| ST | STORAGE TANK |
| STM | STEAM |
| STP | STANDPIPE |
| SVA | SOLENOID VALVE |
| T&P VA | TEMPERATURE & PRESSURE RELIEF VALVE |
| TC | TEST CONNECTION |
| TD | TEMPERATURE DROP |
| TD | TRENCH DRAIN |
| TEMP | TEMPERATURE |
| TP | TRAP PRIMER |
| TW | TEMPERED WATER |
| TYP | TYPICAL |
| U/UR | URINAL |
| UG | UNDERGROUND |
| UNEXC | UNEXCAVATED |
| V | VENT |
| WC | WATER CLOSET |
| WC/L | COMBINATION WATER CLOSET/LAVATORY |
| WCO | WALL CLEAN OUT |
| WH | WALL HYDRANT |
| WHA | WATER HAMMER ARRESTOR |
| WM | WATER MAIN |
| WS | WATER SOFTENER |
| WV | WET VENT |

* NOTE *
ALL OF GENERAL NOTES ON THIS SHEET ARE TO BE APPLIED TO ALL OTHER DRAWINGS IN THIS SET. THE SYMBOLS AND ABBREVIATIONS SHOWN ON THIS SHEET MAY OR MAY NOT BE USED IN THIS SET OF DRAWINGS.

### PIPING VOLUME AND MAXIMUM PIPING LENGTHS TABLE

| NOMINAL PIPE SIZE (INCHES) | VOLUME (LIQUID OUNCES PER FOOT LENGTH) | MAXIMUM PIPING LENGTH (FEET) | |
|---|---|---|---|
| | | PUBLIC LAVATORY FAUCETS | OTHER FIXTURES AND APPLIANCES |
| 1/4 | 0.33 | 6 | 50 |
| 5/16 | 0.5 | 4 | 50 |
| 3/8 | 0.75 | 3 | 50 |
| 1/2 | 1.5 | 2 | 43 |
| 5/8 | 2 | 1 | 32 |
| 3/4 | 3 | 0.5 | 21 |
| 7/8 | 4 | 0.5 | 16 |
| 1 | 5 | 0.5 | 13 |
| 1-1/4 | 8 | 0.5 | 8 |
| 1-1/2 | 11 | 0.5 | 6 |
| 2 OR LARGER | 18 | 0.5 | 4 |

INTERNATIONAL ENERGY CONSERVATION CODE:
The maximum allowable piping length from the nearest source of heated water to the termination of the fixture supply pipe shall be in accordance with the following. Where the piping contains more than one size of pipe, the largest size of pipe within the piping shall be used for determining the maximum allowable length of the piping (see table above).

NOTE:
Hot water mains 1-1/4" and smaller shall be installed with a standard 3-5/8" wall.
Hot water mains 1-1/2" to 3" shall be installed within a 6" wall.

### Table 382.40-5 - May 2016
### MAXIMUM ALLOWABLE LOAD FOR COPPER TUBE - TYPE L, ASTM B88 (C=150)

| PRESSURE LOSS DUE TO FRICTION (IN LBS. PER 100 FT OF LENGTH) | PIPE DIAMETER (IN INCHES) | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1/2" | | | 3/4" | | | 1" | | | 1-1/4" | | | 1-1/2" | | | 2" | | | 2-1/2" | | | 3" | | | 4" | | |
| | | WSFU | | | WSFU | | | WSFU | | | WSFU | | | WSFU | | | WSFU | | | WSFU | | | WSFU | | | WSFU | |
| | GPM | FM | FT | GPM | FM | FT | GPM | FM | FT | GPM | FM | FT | GPM | FM | FT | GPM | FM | FT | GPM | FM | FT | GPM | FM | FT | GPM | FM | FT |
| 0.5 | 0.5 | -- | 0.5 | 2.0 | -- | 2.0 | 4.0 | -- | 4.0 | 7.0 | -- | 9.0 | 11.0 | 4.0 | 15.0 | 23.0 | 7.5 | 37.0 | 40.0 | 30.0 | 86.0 | 65.0 | 90.0 | 200 | 136 | 462 | 561 |
| 1 | 1.0 | -- | 1.0 | 2.5 | -- | 2.5 | 5.5 | -- | 6.5 | 10.0 | 4.0 | 13.0 | 16.0 | 5.0 | 23.0 | 33.0 | 17.5 | 63.0 | 59.0 | 72.0 | 170 | 94.0 | 211 | 345 | 198 | 909 | 923 |
| 2 | 1.5 | -- | 1.5 | 4.0 | -- | 4.0 | 8.5 | -- | 10.5 | 14.5 | 4.5 | 20.5 | 23.0 | 7.5 | 37.0 | 48.0 | 44.0 | 120 | 86.0 | 175 | 305 | 137 | 468 | 566 | 288 | 1694 | 1694 |
| 3 | 2.0 | -- | 2.0 | 5.0 | -- | 6.0 | 10.5 | 4.0 | 14.0 | 18.5 | 6.0 | 27.5 | 29.0 | 12.5 | 52.0 | 60.0 | 75.0 | 175 | 107 | 283 | 410 | 169 | 698 | 752 | 298 | 1792 | 1792 |
| 4 | 2.0 | -- | 2.0 | 6.0 | -- | 7.0 | 12.0 | 4.0 | 16.5 | 21.5 | 7.0 | 33.0 | 34.0 | 18.5 | 66.0 | 70.0 | 108 | 225 | 119 | 356 | 469 | | NP | | | NP | |
| 5 | 2.5 | -- | 2.5 | 6.5 | -- | 8.0 | 14.0 | 4.5 | 20.0 | 24.0 | 8.0 | 40.0 | 38.0 | 26.0 | 80.0 | 77.0 | 136 | 260 | | NP | | | | | | | |
| 6 | 2.5 | -- | 2.5 | 7.5 | -- | 9.5 | 15.5 | 5.0 | 22.5 | 26.0 | 9.0 | 45.0 | 42.0 | 33.0 | 100 | | NP | | | | | | | | | | |
| 7 | 3.0 | -- | 3.0 | 8.0 | -- | 10.0 | 16.5 | 5.5 | 24.0 | 29.0 | 12.5 | 52.0 | 44.0 | 37.0 | 107 | | | | | | | | | | | | |
| 8 | 3.0 | -- | 3.0 | 8.5 | -- | 10.5 | 18.0 | 6.0 | 26.5 | 31.0 | 15.0 | 58.0 | | NP | | | | | | | | | | | | | |
| 9 | 3.5 | -- | 3.5 | 9.5 | -- | 12.5 | 19.0 | 6.0 | 28 | | NP | | | | | | | | | | | | | | | | |
| 10 | 3.5 | -- | 3.5 | 10.0 | 4.0 | 13.0 | 20.0 | 6.5 | 30.0 | | | | | | | | | | | | | | | | | | |
| 11 | 4.0 | -- | 4.0 | 10.5 | 4.0 | 14.0 | 20.5 | 6.5 | 31.0 | | | | | | | | | | | | | | | | | | |
| 12 | 4.0 | -- | 4.0 | 11.0 | 4.0 | 15.0 | | NP | | | | | | | | | | | | | | | | | | | |
| 13 | 4.0 | -- | 4.0 | 11.5 | 4.0 | 15.5 | | | | | | | | | | | | | | | | | | | | | |
| 14 | 4.5 | -- | 5.0 | 12.0 | 4.0 | 16.5 | | | | | | | | | | | | | | | | | | | | | |
| 15 | 4.5 | -- | 5.0 | | NP | | | | | | | | | | | | | | | | | | | | | | |
| 16 | 5.0 | -- | 6.0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | 5.0 | -- | 6.0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | 5.0 | -- | 6.0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | 5.0 | -- | 6.0 | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | 5.5 | -- | 6.5 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | NP | | | | | | | | | | | | | | | | | | | | | | | | | |

NOTES:

WSFU means water supply fixture units.
GPM means gallons per minute.
FM means predominately flushometer type water closets or syphon jet urinals.
FT means predominately flush tank type water closets or wash down urinals.
NP means not permitted, velocities exceed 8 feet per second.

For using this table, round the calculated pressure loss due to friction to the next higher number shown.

SPS 382.40 (7) (f) and (g) specifies minimum sizes for water distribution piping.

## PLUMBING SHEET INDEX


| | |
|---|---|
| P000 | PLUMBING TITLE SHEET |
| PD201 | FIRST FLOOR PLUMBING DEMOLITION PLAN |
| PD202 | SECOND FLOOR PLUMBING DEMOLITION PLAN |
| P199 | FOUNDATION PLUMBING PLAN |
| P201 | BASEMENT AND FIRST FLOOR PLUMBING PLAN |
| P202 | SECOND FLOOR PLUMBING PLAN |
| P500 | PLUMBING DETAILS, SCHEDULES AND ISOMETRICS |



Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 / Fax: 414.778.2360 / r-d@ringdu.com
RD Project Number: 223003.00


Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No. 223010.00
CITY OF WAUWATOSA

Sheet Title
PLUMBING TITLE SHEET


Copyright © 2020 Kahler Slater, Inc. All rights reserved.



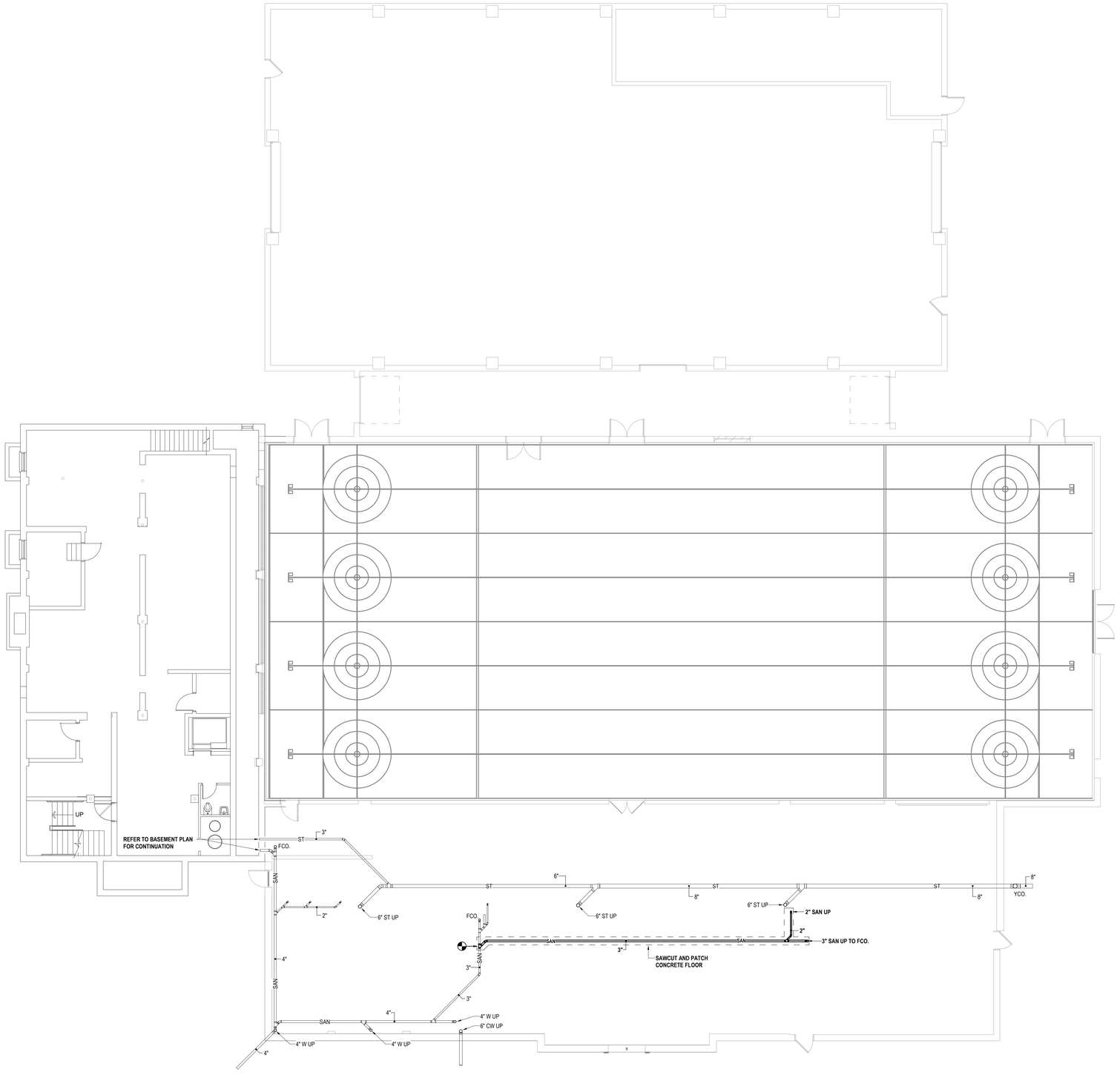
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001


Sheet No.
P000

12/18/2023 2:59:59 PM

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00




1 FOUNDATION PLUMBING PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
FOUNDATION PLUMBING PLAN

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

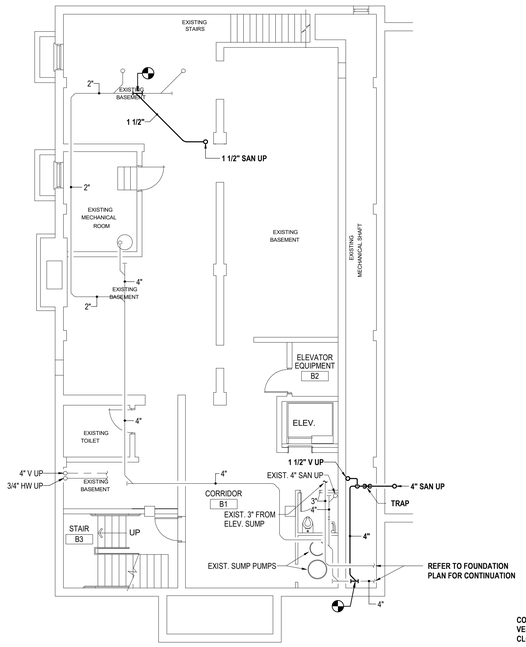
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
P199

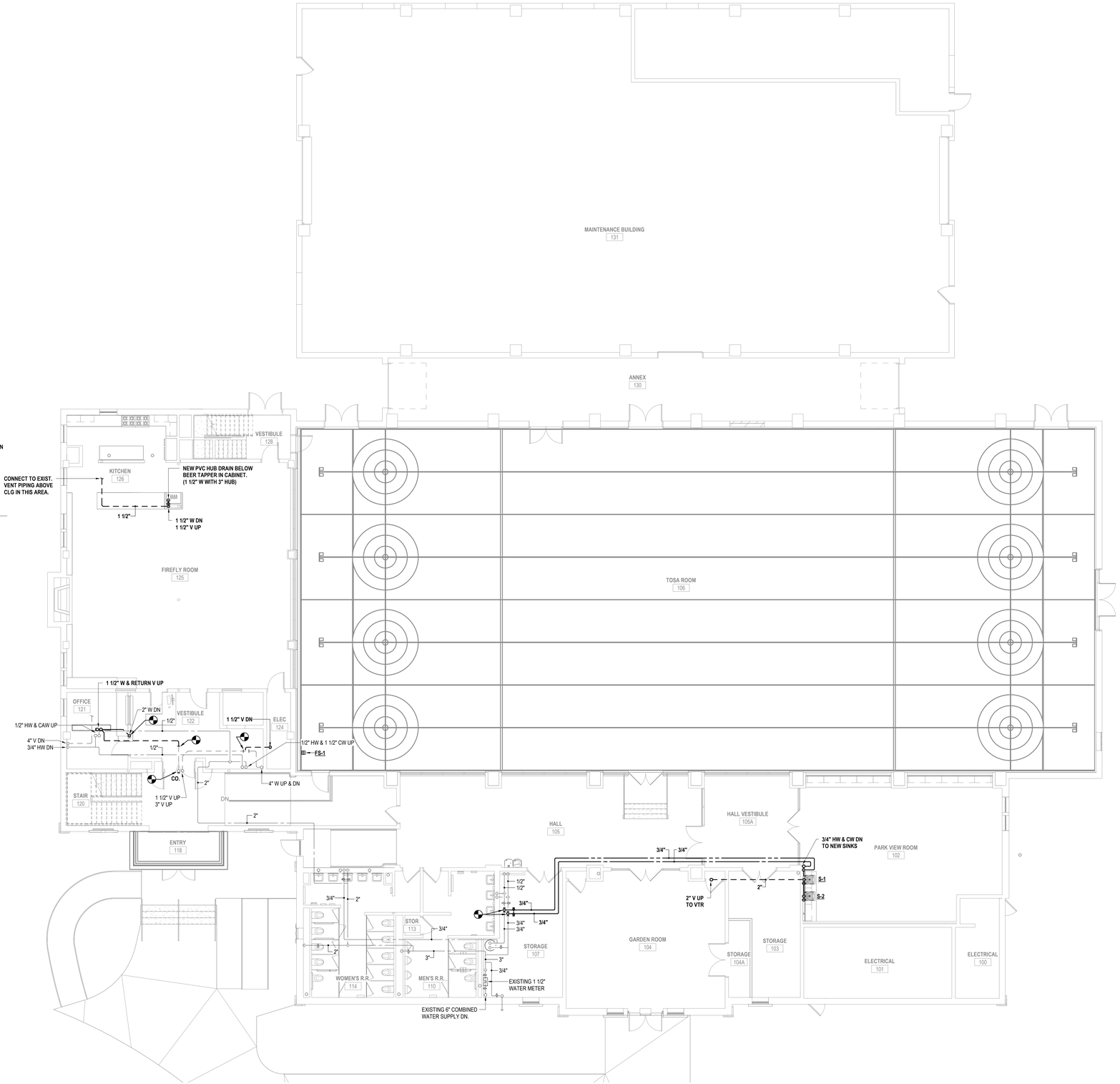
01/05/2023 3:00:01 PM

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00




2 BASEMENT PLUMBING PLAN
1/8" = 1'-0"




1 FIRST FLOOR PLUMBING PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
BASEMENT AND FIRST FLOOR PLUMBING PLAN

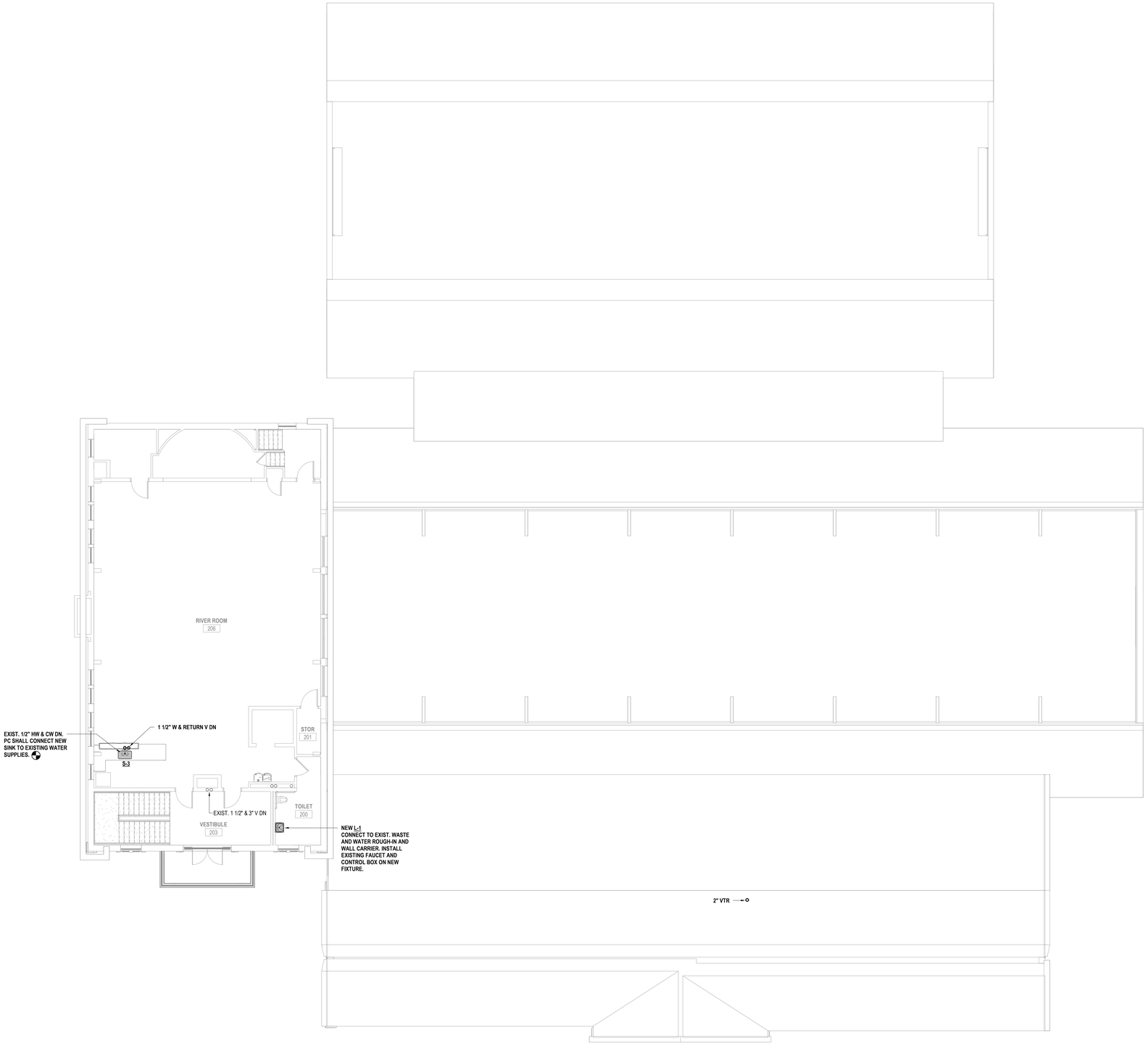
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
P201

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00




1 SECOND FLOOR PLUMBING PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
## SECOND FLOOR PLUMBING PLAN

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
P202

12/18/2023 3:00:08 PM

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00

## FIXTURE SCHEDULE SINKS

NOTE: PLUMBING CONTRACTOR TO VERIFY QUANITIES OF FIXTURES FROM ARCHITECTURAL DRAWINGS.

| TAG | FIXTURE TYPE | MANUFACTURER | FIXTURE MODEL NO. | FIXTURE DESCRIPTION | FAUCET MANUFACTURER | FAUCET MODEL NO. | FAUCET DESCRIPTION | DRAIN | TRAP | STOPS / SUPPLIES |
|---|---|---|---|---|---|---|---|---|---|---|
| S-1 | SINGLE BOWL DROP-IN ADA SINK | ELKAY | LRAD191965-3 | STAINLESS STEEL 19-1/2" X 19" X 6-1/2" SINGLE BOWL DROP-IN ADA SINK WITH (3) FAUCET HOLES. 18 GAUGE 304 STAINLESS STEEL. | KOHLER | K-596 | PULL-DOWN KITCHEN SINK FAUCET WITH THREE-FUNCTION SPRAYHEAD | LK35 STAINLESS STEEL STRAINER BASKET WITH FLEX STEM RUBBER STOPPER AND TAIL PIECE | McGUIRE 8912 1-1/2", 17 GAUGE, C.P. CAST BRASS P-TRAP WITH CLEANOUT PLUG. | MCGUIRE LFH2165CCLK, LEAD FREE 1/2 x 3/8 HEAVY SUPPLIES WITH LOOSE KEY STOPS. |
| S-2 | SINGLE BOWL DROP-IN SINK | ELKAY | DLR191910-3 | STAINLESS STEEL 19-1/2" X 19" X 10-1/8" SINGLE BOWL DROP-IN SINK WITH (3) FAUCET HOLES. 18 GAUGE 304 STAINLESS STEEL. | KOHLER | K-596 | PULL-DOWN KITCHEN SINK FAUCET WITH THREE-FUNCTION SPRAYHEAD | LK35 STAINLESS STEEL STRAINER BASKET WITH FLEX STEM RUBBER STOPPER AND TAIL PIECE | McGUIRE 8912 1-1/2", 17 GAUGE, C.P. CAST BRASS P-TRAP WITH CLEANOUT PLUG. | MCGUIRE LFH2165CCLK, LEAD FREE 1/2 x 3/8 HEAVY SUPPLIES WITH LOOSE KEY STOPS. |
| S-3 | SINGLE BOWL DROP-IN SINK | ELKAY | DLR312210-3 | STAINLESS STEEL 31" X 22" X 10-1/8" SINGLE BOWL DROP-IN SINK WITH (3) FAUCET HOLES. 18 GAUGE 304 STAINLESS STEEL. | KOHLER | K-596 | PULL-DOWN KITCHEN SINK FAUCET WITH THREE-FUNCTION SPRAYHEAD | LK35 STAINLESS STEEL STRAINER BASKET WITH FLEX STEM RUBBER STOPPER AND TAIL PIECE | McGUIRE 8912 1-1/2", 17 GAUGE, C.P. CAST BRASS P-TRAP WITH CLEANOUT PLUG. | MCGUIRE LFH2165CCLK, LEAD FREE 1/2 x 3/8 HEAVY SUPPLIES WITH LOOSE KEY STOPS. |

## FIXTURE SCHEDULE LAVATORYS

NOTE: PLUMBING CONTRACTOR TO VERIFY QUANITIES OF FIXTURES FROM ARCHITECTURAL DRAWINGS.

| TAG | FIXTURE TYPE | MANUFACTURER | FIXTURE MODEL NO. | FIXTURE DESCRIPTION | FAUCET MANUFACTURER | FAUCET MODEL NO. | FAUCET DESCRIPTION | LAVATORY CARRIER | DRAIN AND TRAP | STOPS / SUPPLIES |
|---|---|---|---|---|---|---|---|---|---|---|
| L-1 | LAVATORY WALL MOUNT ADA | KOHLER | KINGSTON K-2007-0 | WALL MOUNT BARRIER FREE WHITE VITREOUS CHINA LAVATORY DRILLED FOR CONCEALED ARM CARRIER WITH CENTER FAUCET OPENING. | SLOAN (EXISTING) | - | EXISTING BATTERY OPERATED FAUCET WITH BLUETOOTH CONTROL BOX TO BE REMOVED AND REINSTALLED ON NEW LAVATORY. | EXISTING CARRIER TO REMAIN | MCGUIRE PW2150WC, 1-1/2, 17 GAUGE, PRE-WRAPPED OFFSET DRAIN ASSEMBLY, STRAINER AND ADJUSTABLE P-TRAP WITH CLEANOUT AND TRAP, DRAIN AND SUPPLY STOP COVERS. | MCGUIRE LFH2165CCLK, LEAD FREE 1/2 x 3/8 HEAVY SUPPLIES WITH LOOSE KEY STOPS. |

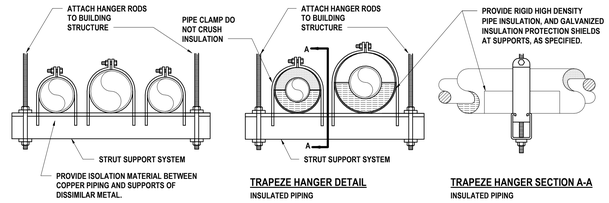
## FIXTURE SCHEDULE DRAIN SCHEDULE

NOTE: PROVIDE FLASHING FOR ALL DRAINS INSTALLED ABOVE GRADE.

| TAG | DESCRIPTION | LOCATION | MATERIAL | | | FLASHING CLAMP | MISC. | TRAP PRIMER | TRAP SEAL | MANUFACTURER | MODEL NUMBER |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BODY | TOP | STRAINER | | | | | | |
| FS-1 | STAINLESS STEEL FLOOR SINK | TOSA ROOM FLOOR | STAINLESS STEEL | STAINLESS STEEL | STAINLESS STEEL | NO | STAINLESS STEEL FLOOR SINK WITH STAINLESS STEEL INTERIOR DOME STRAINER AND SOLID GASKETED COVER | NO | NO | ZURN | Z1750-SG |

## FIXTURE SCHEDULE CLEANOUT SCHEDULE

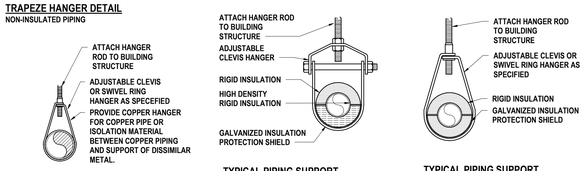
| TAG | DESCRIPTION | MATERIAL | | | ANCHOR PLATE | CONCRETE PAD | MISCELLANEOUS | MANUFACTURER | MODEL NUMBER |
|---|---|---|---|---|---|---|---|---|---|
| | | BODY | COVER | FACE PLATE | | | | | |
| FCO. | FLOOR CLEANOUT W/ ROUND TOP | CAST IRON | POLISHED NICKEL BRONZE | NICKEL BRONZE | NO | NO | | ZURN | ZN1400 |




**TRAPEZE HANGER DETAIL**
NON-INSULATED PIPING

**TRAPEZE HANGER DETAIL**
INSULATED PIPING

**TRAPEZE HANGER SECTION A-A**
INSULATED PIPING

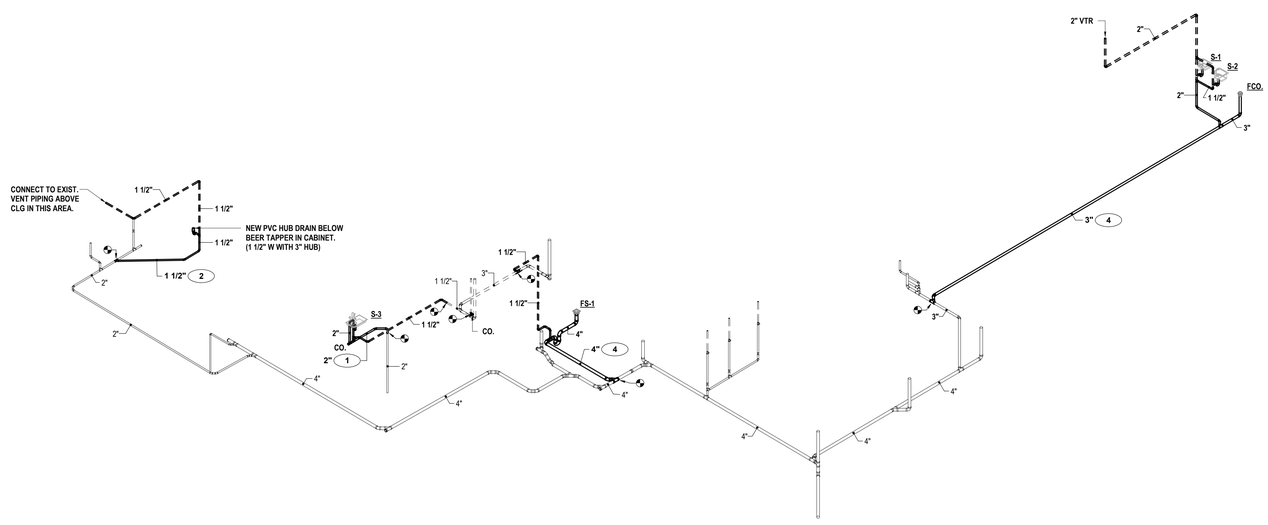



**TYPICAL PIPING SUPPORT FOR ALL NON-INSULATED PIPING**

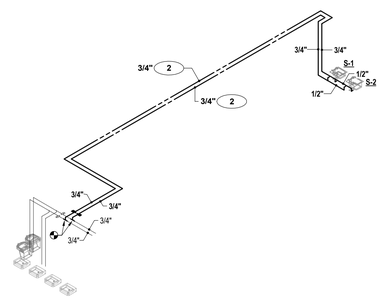
**TYPICAL PIPING SUPPORT FOR ALL INSULATED PIPING LARGER THAN 3/4"**

**TYPICAL PIPING SUPPORT FOR ALL INSULATED PIPING 3/4" AND SMALLER**

1 TYPICAL PIPE SUPPORT DETAILS
NOT TO SCALE




2 DOMESTIC WATER RISER DIAGRAM
NOT TO SCALE




3 DOMESTIC WATER RISER DIAGRAM
NOT TO SCALE

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
PLUMBING DETAILS, SCHEDULES AND ISOMETRICS

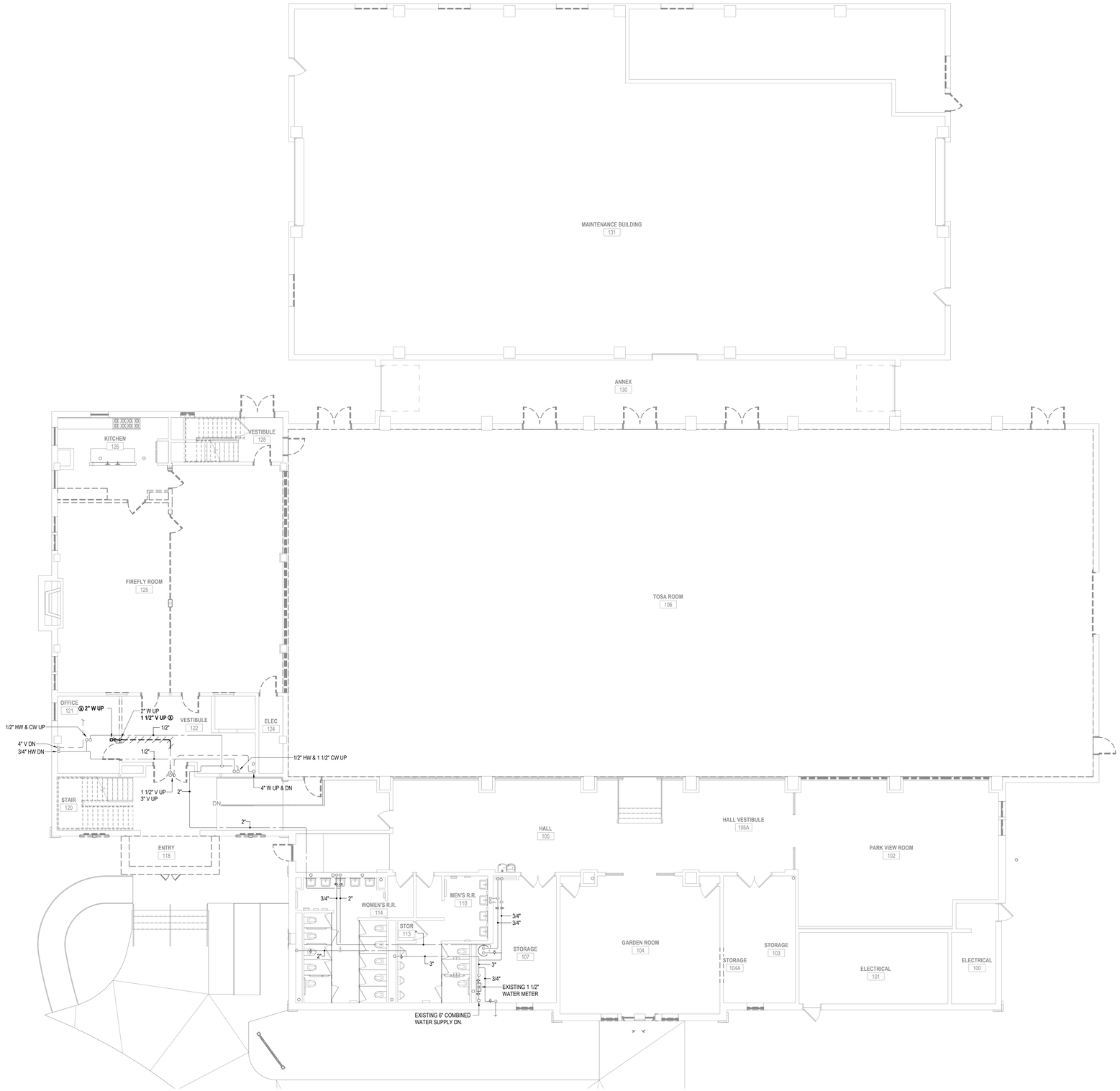
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
P500

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00




1 FIRST FLOOR PLUMBING DEMOLITION PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
## FIRST FLOOR PLUMBING DEMOLITION PLAN

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

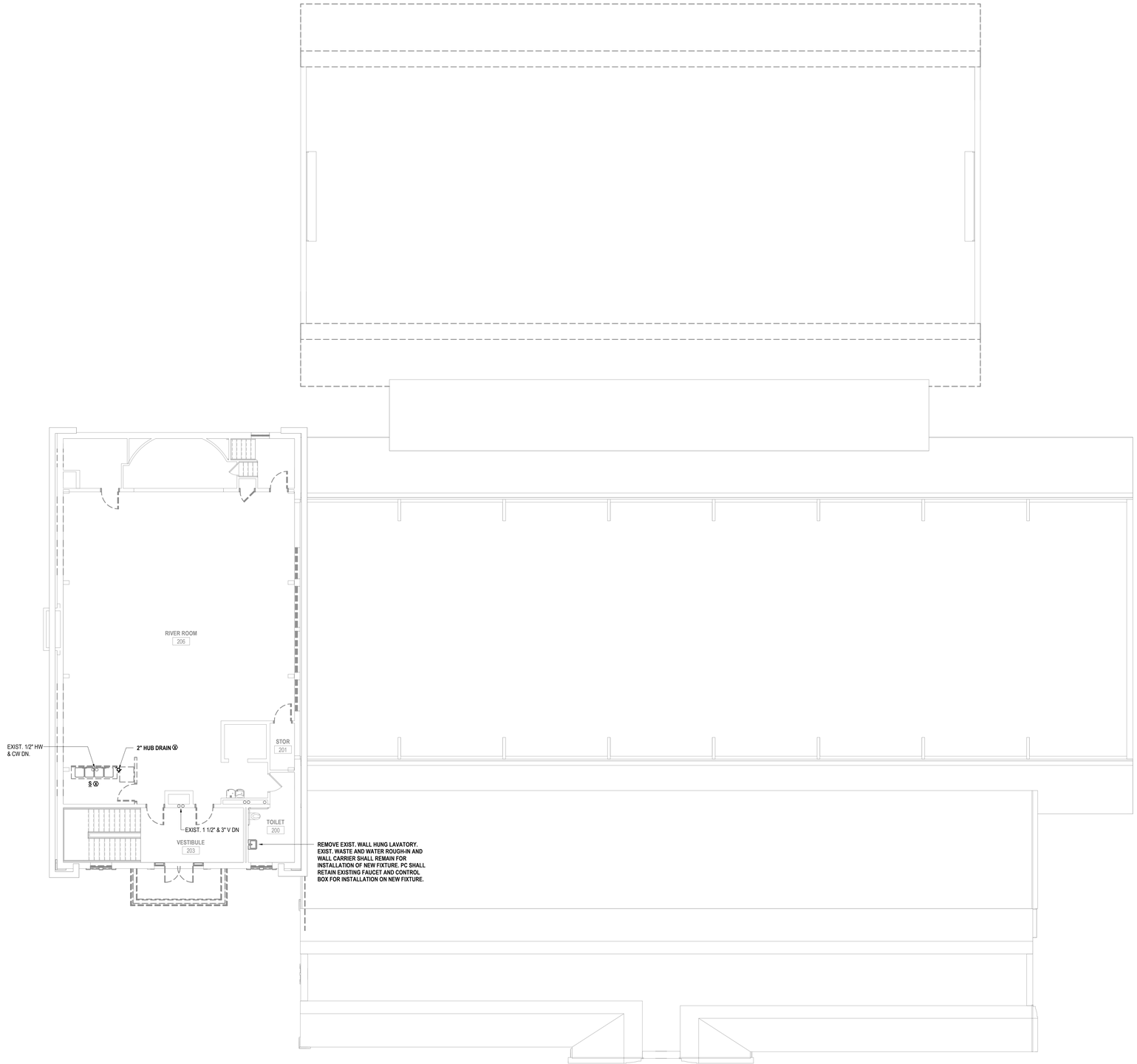
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
PD201

01/10/2023 3:00:24 PM

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00




1 SECOND FLOOR PLUMBING DEMOLITION PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
SECOND FLOOR PLUMBING DEMOLITION PLAN

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
PD202

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

## HVAC SYMBOLS

- 18/12 — SQUARE DUCT SIZE TAG (WIDTH/HEIGHT)
- 18/12Ø — OVAL DUCT SIZE TAG (WIDTH/HEIGHT)
- 18Ø — ROUND DUCT SIZE TAG (DIAMETER)
- (EX)18Ø — EXISTING DUCT TAG
- 18/12 — DUCT BEING DEMOLISHED
- 18/18 SA — SUPPLY AIR
- 18/18 SOA — CONDITIONED OUTSIDE AIR
- 18/18 OA — OUTSIDE AIR
- 18/18 RA — RETURN AIR
- 18/18 TA — TRANSFER AIR
- 18/18 EA — EXHAUST AIR
- 18/18 LA — RELIEF AIR
- 18/18 GEA — GREASE EXHAUST AIR
- 18/18 CEA — CONDENSATE EXHAUST AIR
- 18/18 SEA — SMOKE EXHAUST AIR
- D — DUCT (R)ISE / (D)ROP
- D — ROUND DUCT (R)ISE / (D)ROP
- 1.5W, 1W — RADIUS ELBOW
- MITERED ELBOW WITHOUT TURNING VANES
- MITERED ELBOW WITH TURNING VANES
- RECTANGULAR BRANCH TAKEOFF
- ROUND BRANCH TAKEOFF
- RECTANGULAR BRANCH TAKEOFF
- BULLHEAD TEE FOR SUPPLY
- RADIUS TEE FOR SUPPLY
- ECCENTRIC TRANSITION
- CONCENTRIC TRANSITION
- SQUARE TO ROUND TRANSITION
- DUCT CAP
- FLEXIBLE DUCTWORK
- HIDDEN DUCTWORK
- S.S.18/18 — STAINLESS STEEL DUCTWORK
- CONSTANT VOLUME OR VARIABLE VOLUME AIR TERMINAL UNIT WITH REHEAT COIL AND ACCESS
- CONSTANT VOLUME OR VARIABLE VOLUME AIR TERMINAL UNIT WITH ACCESS
- VENTURI STYLE AIR TERMINAL UNIT WITH REHEAT COIL AND ACCESS
- VENTURI STYLE AIR TERMINAL UNIT WITH ACCESS
- VENTURI STYLE DUAL SQUARE FLANGE AIR TERMINAL UNIT WITH ACCESS
- FAN POWERED CONSTANT VOLUME OR VARIABLE VOLUME AIR TERMINAL UNIT WITH ACCESS
- DUAL DUCT AIR TERMINAL UNIT WITH ACCESS
- DUCT MOUNTED ELECTRIC REHEAT COIL WITH ACCESS
- HOT WATER REHEAT COIL OR CHILLED WATER COOLING COIL
- AIR CURTAIN
- ACCESS DOOR
- FLEXIBLE CONNECTION
- SURFACE MOUNTED STEEL RADIATION, OR BASEBOARD
- SURFACE MOUNTED HVAC EQUIPMENT
- SEMI-RECESSED HVAC EQUIPMENT
- FULLY RECESSED HVAC EQUIPMENT
- THRU-WALL PACKAGED AIR CONDITIONING UNIT OR HEAT PUMP
- AIR FLOW MEASURING STATION
- DUCT SECURITY BARS
- DSD OR SD — DUCT SMOKE DETECTOR
- DROP — RECTANGULAR SUPPLY/OUTSIDE AIR DUCT RISE
- DROP — ROUND SUPPLY/OUTSIDE AIR DUCT RISE
- DROP — RECTANGULAR RETURN/TRANSFER AIR DUCT RISE
- DROP — ROUND RETURN/TRANSFER AIR DUCT RISE
- DROP — RECTANGULAR EXHAUST/RELIEF AIR DUCT RISE
- DROP — ROUND EXHAUST/RELIEF AIR DUCT RISE
- NON-DDC VENTURI STYLE FLOW METER (FOR BALANCING PURPOSES)
- PRESSURE GAUGE WITH NEEDLE VALVE
- PRESSURE GAUGE WITH NEEDLE VALVE
- AUTOMATIC AIR VENT
- MANUAL AIR VENT
- PUMP
- STEAM TRAP
- BALL TYPE EXPANSION JOINT
- EXPANSION LOOP
- STRAINER WITH DRAIN VALVE AND HOSE CONNECTION AND BRASS CAP
- STRAINER WITH DRAIN VALVE
- STRAINER
- FM — DDC FLOW METER
- THERMOMETER
- PRESSURE GAUGE
- DDC PRESSURE SENSOR
- ΔP — DIFFERENTIAL PRESSURE SENSOR
- FS — STRAINER
- TEST CONNECTION
- ANCHOR
- PIPE GUIDE
- FLEXIBLE CONNECTION
- SUPPLY GRILLE (4-WAY THROW)
- SUPPLY GRILLE (3-WAY THROW)
- (R)ETURN/ (T)RANSFER GRILLE
- (E)XHAUST GRILLE
- PIPING CAP
- BLIND FLANGE / CLEAN OUT
- T — PIPE-LINE DDC TEMPERATURE SENSOR
- DIRECTION OF FLOW
- PIPING REDUCER OR INCREASER
- ECCENTRIC REDUCER OR INCREASER
- TOP CONNECTION , 45° OR 90°
- BOTTOM CONNECTION , 45° OR 90°
- SIDE CONNECTION
- PIPING RISE OR DROP
- PIPING DOWN
- PIPING UP
- UNION / FLANGED CONNECTIONS
- UCD — DOOR UNDERCUT
- DG — DOOR GRILLE
- PIPE/ DUCT PITCH
- ΔP, DP — DIFFERENTIAL PRESSURE SENSOR
- T — FREEZESTAT
- T — AVERAGING TEMPERATURE SENSOR
- TC — TIME CLOCK
- DS — DOOR SWITCH
- DPT — DIFFERENTIAL PRESSURE TRANSMITTER
- DPS — DIFFERENTIAL PRESSURE SWITCH
- PSH — PRESSURE SWITCH HIGH
- PSL — PRESSURE SWITCH LOW
- OCC — OCCUPANCY SENSOR
- HHL — HUMIDITY HIGH LIMIT
- HOA — HAND-OFF AUTO SWITCH
- CS — CONDUCTIVITY SWITCH
- CT — CONDUCTIVITY TRANSMITTER
- IS — CURRENT SWITCH
- IT — CURRENT TRANSMITTER
- LC — LEVEL CONTROLLER
- TC — LEVEL TRANSMITTER
- SC — SPEED CONTROLLER
- PT — PRESSURE TRANSMITTER
- S — SENSOR
- PC — PRESSURE CONTROLLER
- FS — FLOW SWITCH
- PM — PRESSURE MONITOR
- DP — DEW POINT SENSOR
- SP — STATIC PRESSURE SENSOR
- X, Y — X=SECTION NUMBER SHOWN ON DRAWING SHEET Y

### MECHANICAL EQUIPMENT TAGS

- HEATING COIL FLOW — VAV-XX — Htg: 3.7 GPM — VAV BOX
- BOTTOM OF EQUIPMENT ELEVATION — VAV-XX — 10' - 0"
- EXISTING EQUIPMENT TO REMAIN — (EX)VAV-XX
- EXISTING RELOCATED EQUIPMENT — (ER)VAV-XX
- EQUIPMENT BY OTHERS (REFER TO OTHER DISCIPLINE FOR ADDITIONAL INFORMATION) — VAV-XX
- OPERATING WEIGHT NOT INCLUDING CURB — RTU-XX — 590 lb
- RTU-XX — 4.0 ton — NOMINAL COOLING CAPACITY
- ROOFTOP UNIT
- FUEL INPUT GAS PIPE FLOW — RTU-XX — 115,000 Btu/h — 115 CFH

### DATA DEVICE TAGS

- EQUIPMENT ID — RTU-XX — SYMBOL
- TS — TEMPERATURE SENSOR
- PM — C3H3 — C3H3 DETECTOR
- HS — CH4 — CH4 DETECTOR
- TC — CO2 — CO2 DETECTOR
- TH — CO — CO DETECTOR
- T — H2 — H2 DETECTOR
- H — H2S — H2S DETECTOR
- O2 — HZG — HAZARDOUS GAS DETECTOR
- NO2 — NO2 DETECTOR
- PRESSURE MONITOR
- HUMIDITY SENSOR
- TEMPERATURE & CO2 SENSOR
- TEMPERATURE & HUMIDITY SENSOR
- THERMOSTAT
- HUMIDISTAT
- O2 DETECTOR
- PANEL NAME
- BMS CONTROL PANEL — HVAC-TCP

### GRILLES, REGISTERS & DIFFUSERS TAG

- SD1 — 10 (400) — TYPE (SEE SCHEDULE) — CFM — NECK SIZE
- (EX)EG — 14x6 — TYPE (SEE SCHEDULE) — NECK SIZE

### DAMPER TAGS

- COMB. FIRE/SMOKE DAMPER — S
- FIRE DAMPER — F
- SMOKE DAMPER — SD
- BALANCING DAMPER — B
- MOTOR OPERATED DAMPER — M
- BACKDRAFT DAMPER — D

## PIPING SYMBOLS

- CHWR — CHILLED WATER RETURN
- CHWS — CHILLED WATER SUPPLY
- CD — CONDENSATE DRAINAGE
- CWR — CONDENSER WATER RETURN
- CWS — CONDENSER WATER SUPPLY
- GWR — GEOTHERMAL WATER RETURN
- GWS — GEOTHERMAL WATER SUPPLY
- HWR — HOT WATER RETURN
- HWS — HOT WATER SUPPLY
- G — NATURAL GAS
- PG — PROPANE GAS
- REF-L — REFRIGERANT-LIQUID
- REF-S — REFRIGERANT-SUCTION
- REF-HG — REFRIGERANT-HOT GAS
- STM — STEAM
- CDR — CONDENSATE RETURN
- BBD — BOILER BLOWDOWN
- BF — BOILER FEED
- BWS — BOILER WATER SAMPLE
- CF — CHEMICAL FEED
- CHWR — CHILLED / HOT WATER RETURN
- CHWS — CHILLED / HOT WATER RETURN
- CWR — CHILLED WATER RETURN
- CWS — CHILLED WATER SUPPLY
- CA — COMPRESSED AIR
- CA (XX) — COMPRESSED AIR (XX PSIG)
- CR — CONDENSER RETURN
- CS — CONDENSER SUPPLY
- CBD — CONTINUOS BLOWDOWN
- CW — DOMESTIC COLD WATER
- HW — DOMESTIC HOT WATER
- DW — DOMESTIC WATER
- D — DRAIN
- FOR — FUEL OIL RETURN
- FOR (XX) — FUEL OIL RETURN (XX PSIG)
- FOS — FUEL OIL SUPPLY
- FOS (XX) — FUEL OIL SUPPLY (XX PSIG)
- GR — GLYCOL RETURN
- GS — GLYCOL SUPPLY
- HPC — HIGH PRESSURE CONDENSATE
- HPS — HIGH PRESSURE STEAM
- HPS (XX) — HIGH PRESSURE STEAM (XX PSIG)
- HWR — HOT WATER RETURN
- HWS — HOT WATER SUPPLY
- LPC — LOW PRESSURE CONDENSATE
- LPS — LOW PRESSURE STEAM
- LP — LOW PRESSURE GAS
- LP (XX) — LOW PRESSURE GAS (XX PSIG)
- MUW — MAKE UP WATER
- G — NATURAL GAS
- G (XX) — NATURAL GAS (XX PSIG)
- OR — OIL RETURN
- OR (XX) — OIL RETURN (XX PSIG)
- OS — OIL SUPPLY
- OS (XXX) — OIL SUPPLY (XX PSIG)
- ? — OTHER
- OFL — OVERFLOW
- PCR — PUMP CONDENSATE RETURN
- RE — REFRIGERANT ECONOMIZER
- RHG — REFRIGERANT HOT GAS
- RL — REFRIGERANT LIQUID
- RS — REFRIGERANT SUCTION
- REL — REFRIGERANT / STEAM RELIEF
- RO — RO WATER
- SW — SOFTENED WATER
- SWR — SOLAR WATER RETURN
- SWS — SOLAR WATER SUPPLY
- VAC — VACUUM CONDENSATE RETURN
- V — VENT
- 2" — PIPE SIZE TAG (DIAMETER)
- ABOVE GROUND PIPING
- 1/8" / 12" SLOPE — PIPE SLOPE TAG
- BELOW GROUND PIPING
- PIPE INVERT ELEVATION TAG
- (EX) 2" — EXISTING PIPE TAG
- 2" — PIPING BEING DEMOLISHED

PIPE DROP, PIPE RISE, PIPE TEE, CAP — 4", 2", 4" — PLUG, REDUCING 45 DEGREE TEE, 45 DEGREE TEE

### PIPE ACCESSORY TAGS

- BALL VALVE
- BALANCING VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- CIRCUIT SETTER
- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- BALANCING VALVE
- SHUT-OFF VALVE
- DRAIN VALVE
- FLOW CONTROL VALVE
- COMBINATION VALVE
- PRESS. RELIEF VALVE
- AUTO MAKE-UP VALVE
- TWO WAY TEMP. CONTROL VALVE
- LOCK SHIELD VALVE
- PRESS REDUCING
- QUICK OPENING
- STRAINER
- EMERG. GAS SHUTOFF
- PLUG VALVE
- GAS SHUTOFF COCK
- PRESSURE REDUCING VALVE
- THREE WAY TEMP. CONTROL VALVE
- DIAPHRAGM VALVE
- PLUG VALVE
- OS + Y GATE VALVE
- NEEDLE VALVE/ GAUGE COCK
- GLOBE VALVE
- SOLENOID VALVE
- ELEC. CONTROL
- 3-WAY ELEC. CONTROL

* NOTE *
ALL OF GENERAL NOTES ON THIS SHEET ARE TO BE APPLIED TO ALL OTHER DRAWINGS IN THIS SET.(THE SYMBOLS AND ABBREVIATIONS SHOWN ON THIS SHEET MAY OR MAY NOT BE USED IN THIS SET OF DRAWINGS).

## APPLICABLE CODES AND STANDARDS

**THE MECHANICAL SYSTEMS SPECIFICATIONS WILL REFERENCE THE FOLLOWING CODES, GUIDELINES AND STANDARDS AND ARE DESIGNED TO MEET OR EXCEES THESE STANDARDS.**

a. INTERNATIONAL BUILDING CODE - 2015 EDITION.
b. INTERNATIONAL ENERGY CONSERVATION CODE - 2015 EDITION.
c. INTERNATIONAL MECHANICAL CODE - 2015 EDITION.
d. INTERNATIONAL FUEL GAS CODE - 2015 EDITION.
e. NATIONAL ELECTRICAL CODE - 2017 EDITION.
f. WISCONSIN ADMINISTRATIVE CODE - MOST CURRENT.
g. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) CODE - 2012 EDITION.
h. AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEER (ASHRAE)
i. AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
j. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
k. SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC. (SMACNA)
l. DEPARTMENT OF NATURAL RESOURCES (DNR)
m. AMERICAN DISABILITIES ACT (ADA).

* NOTE *
ALL OF GENERAL NOTES ON THIS SHEET ARE TO BE APPLIED TO ALL OTHER DRAWINGS IN THIS SET.THE SYMBOLS AND ABBREVIATIONS SHOWN ON THIS SHEET MAY OR MAY NOT BE USED IN THIS SET OF DRAWINGS.

## GENERAL MECHANICAL SYMBOLS

- REVISION NUMBER - SHOWN ON PLANS
- POINT WHERE NEW CONNECTS TO EXISTING
- NUMBER OF DETAIL ON SHEET
- NUMBER OF SHEET WHERE DETAIL APPEARS
- KEYED NOTE
- CONTINUATION SYMBOL
- Room 5 — ROOM NAME AND NUMBER
- ITEM TO BE DEMOLISHED
- AREA NOT IN CONTRACT
- BREAK / CONTINUATION SYMBOL

## MECHANICAL SHEET INDEX


| | |
|---|---|
| M000 | MECHANICAL SYMBOLS AND SHEET INDEX |
| M001 | MECHANICAL NOTES AND ABBREVIATIONS |
| MD201 | FIRST FLOOR MECHANICAL DEMOLITION PLAN |
| MD202 | SECOND FLOOR MECHANICAL DEMOLITION PLAN |
| M201 | FIRST FLOOR MECHANICAL PLAN |
| M202 | SECOND FLOOR MECHANICAL PLAN |
| M600 | MECHANICAL DETAILS |
| M700 | HVAC MASTER SCHEDULES |


Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No. 223010.00
CITY OF WAUWATOSA

Sheet Title
MECHANICAL SYMBOLS AND SHEET INDEX

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
M000

## ABBREVIATIONS

| | |
|---|---|
| Ø | ROUND |
| # | POUND |
| AAV | AUTOMATIC AIR VENT |
| AB | AIR BLENDER |
| ABV | ABOVE |
| AC | AIR CONDITIONING |
| AC | AIR CONDITIONING UNIT |
| ACC | AIR-COOLED CHILLER |
| ACCU | AIR COOLING CONDENSING UNIT |
| ACH | AIR CHANGES PER HOUR |
| AD | ACCESS DOOR |
| ADD | ADDENDUM |
| AFF | ABOVE FINISHED FLOOR |
| AFMS | AIR FLOW MEASURING STATION |
| AFUE | ANNUAL FUEL UTILIZATION EFFICIENCY |
| AHU | AIR HANDLING UNIT |
| ALT | ALTERNATE |
| AMV | AUTO MAKE-UP VALVE |
| AP | ACCESS PANEL |
| APD | AIR PRESSURE DROP |
| ARCH | ARCHITECT/ARCHITECTURAL |
| AS | AIR SEPARATOR |
| ATU | AIR TERMINAL UNIT |
| B | BOILER |
| BB | BASEBOARD RADIATION |
| BBD | BOILER BLOWDOWN |
| BCU | BLOWER COIL UNIT |
| BDD | BACKDRAFT DAMER |
| BF | BLIND FLANGE |
| BF | BOILER FEED |
| BFF | BELOW FINISHED FLOOR |
| BHP | BRAKE HORSEPOWER |
| BLW | BELOW |
| BOD | BOTTOM OF DUCT |
| BOP | BOTTOM OF PIPE |
| BTU | BRITISH THERMAL UNITS |
| BTUH | BRITISH THERMAL UNITS PER HOUR |
| BV | BALANCING VALVE |
| CAP | CAPACITY |
| CAV | CONSTANT AIR VOLUME |
| CENT. | CENTRIFUGAL |
| CFM | CUBIC FEET PER MINUTE |
| CH | CHILLER |
| CHR | CHILLED WATER RETURN |
| CHS | CHILLED WATER SUPPLY |
| CHV | CHECK VALVE |
| CHWP | CHILLED WATER PUMP |
| CLG | CEILING |
| CO | CLEAN OUT |
| CS | CONDUCTIVITY SWITCH |
| CT | COOLING TOWER |
| CT | COOLING TOWER |
| CUH | CABINET UNIT HEATER |
| CV | COMBINATION VALVE |
| CW | COLD WATER |
| D | DRAIN |
| D | DROP |
| D | DEGREE |
| DB | DECIBELS |
| DB | DRY BULB |
| DC | DRY COOLER |
| DC | DUCT MOUNTED COIL |
| DCP | DOMESTIC WATER CIRCULATING PUMP |
| DIA | DIAMETER |
| DN | DOWN |
| DP | DEWPOINT |
| DPS | DIFFERENTIAL PRESSURE SENSOR |
| DPT | DIFFERENTIAL PRESSURE TRANSMITTER |
| DS | DOOR SWITCH |
| DSD | DUCT SMOKE DETECTOR |
| DSS | DUCTLESS SPLIT SYSTEM |
| DTG | DOOR TRANSFER GRILLE |
| DV | DRAIN VALVE |
| DW | DOMESTIC WATER |
| DWDI | DOUBLE WIDTH DOUBLE INLET |
| (E) | EXISTING |
| E.C. | ELECTRICAL CONTACTOR |
| EA | EACH |
| EA | EXHAUST AIR |
| EA | EXHAUST AIR |
| EAT | ENTERING AIR TEMPERATURE |
| EBB | ELECTRIC BASEBOARD RADIATION |
| ECM | ELECTRICALLY COMMUTATED MOTOR |
| EDC | ELECTRIC DUCT COIL |
| EF | EXHAUST FAN |
| EG | EXHAUST GRILLE |
| ELEC | ELECTRICAL |
| EQUIP | EQUIPMENT |
| ESP | EXTERNAL STATIC PRESSURE |
| ET | EXPANSION TANK |
| ETR | EXISTING TO REMAIN |
| EWT | ENTERING WATER TEMPERATURE |
| F | FILTER |
| F | DEGREES FAHRENHEIT |
| FC | FORWARD CURVED |
| FCO | FLOOR CLEAN OUT |
| FCU | FAN COIL UNIT |
| FCV | FLOW CONTROL VALVE |
| FD | FIRE DAMPER |
| FL | FLOOR |
| FLA | FULL LOAD AMPERES |
| FM | FLOW METER |
| FO | FUEL OIL |
| FOR | FUEL OIL RETURN |
| FOS | FUEL OIL SUPPLY |
| FOV | FUEL OIL VENT |
| FPM | FEET PER MINUTE |
| FPR | FINNED PIPE RADIATION |
| FPVAV | FAN POWERED VARIABLE AIR VOLUME |
| FSD | COMB. FIRE/ SMOKE DAMPER |
| FT | FOOT/FEET |
| FTR | FIN TUBE RADIATION |
| G | NATURAL GAS |
| G.C. | GENERAL CONTRACTOR |
| GAL | GALLON |
| GC | GENERAL CONTRACTOR |
| GF | GAS-FIRED |
| GLV | GLOBE VALVE |
| GPM | GALLONS PER MINUTE |
| GPN | GALLONS PER MINUTE |
| GR | GLYCOL WATER RETURN |
| GRV | GRAVITY ROOF VENTILATOR |
| GS | GLYCOL WATER SUPPLY |
| H.C. | HEATING / HVAC CONTRACTOR |
| HB | HOSE BIB |
| HEPA | HIGH EFFICIENCY PARTICULATE ARRESTANCE |
| HHL | HUMIDITY HIGH LIMIT |
| HOA | HAND-OFF-AUTO |
| HP | HORSEPOWER |
| HPC | HIGH PRESSURE CONDENSATE |
| HPS | HIGH PRESSURE STEAM |
| HR | HOUR |
| HRU | HEAT RECOVERY UNIT |
| HTG | HEATING |
| HTR | HEATER |
| HUM | HUMIDIFIER |
| HW | HOT WATER (DOMESTIC) |
| HW | HOT WATER |
| HWP | HOT WATER PUMP |
| HWP | HEATING WATER PUMP |
| HWR | HOT WATER RETURN |
| HWS | HOT WATER SUPPLY |
| HZ | HERTZ |
| I | CURRENT |
| ID | INDIRECT |
| IN | INCH |
| INV | INVERT |
| IS | CURRENT SWITCH |
| IT | CURRENT TRANSMITTER |
| KW | KILOWATT |
| LAT | LEAVING AIR TEMPERATURE |
| LB | POUND |
| LB/HR | POUNDS PER HOUR |
| LC | LEVEL CONTROLLER |
| LP | LIQUID PETROLEUM |
| LP | LOW PRESSURE |
| LPC | LOW PRESSURE CONDENSATE |
| LPG | LIQUEFIED PETROLEUM GAS |
| LPS | LOW PRESSURE STEAM |
| LRA | LOCKED ROTOR AMPERES |
| LSD | LINEAR SLOT DIFFUSER |
| LT | LEVEL TRANSMITTER |
| LVR | LOUVER |
| LWT | LEAVING WATER TEMPERATURE |
| M.C. | MECHANICAL CONTRACTOR |
| M/A | MIXED AIR |

| | |
|---|---|
| MAU | MAKE-UP AIR UNIT |
| MAV | MANUAL AIR VENT |
| MAX | MAXIMUM |
| MBH | ONE THOUSAND BTU PER HOUR |
| MCA | MINIMUM CIRCUIT AMPACITY |
| MCC | MOTOR CONTROL CENTER |
| MCF | ONE THOUSAND CUBIC FEET |
| MECH | MECHANICAL |
| MERV | MINIMUM EFFICIENCY REPORTING VALUE |
| MFR | MANUFACTURER |
| MIN. | MINIMUM |
| MISC | MISCELLANEOUS |
| MOCP | MAXIMUM OVER-CURRENT PROTECTION |
| MOD | MOTOR OPERATED DAMPER |
| MTR | MOTOR |
| MUW | MAKE-UP WATER |
| NC | NOISE CRITERIA |
| NC | NORMALLY CLOSED |
| NIC | NOT IN CONTRACT |
| NO | NUMBER |
| NO | NORMALLY OPEN |
| NO2 | NITROGEN DIOXIDE |
| NPSH | NET POSITIVE SUCTION HEAD |
| NTS | NOT TO SCALE |
| OA | OUTSIDE AIR |
| OCC | OCCUPANCY |
| ODP | OPEN DRIP PROOF |
| OFL | OVERFLOW |
| OS | OCCUPANCY SENSOR |
| OS&Y | OUTSIDE STEM AND YOKE |
| P | PUMP |
| P | PRESSURE |
| P.C. | PLUMBING CONTRACTOR |
| PB | PUSH BUTTON |
| PC | PRESSURE CONTROLLER |
| PC | PUMPED CONDENSATE |
| PCR | PUMPED CONDENSATE RETURN |
| PD | PRESSURE DROP |
| PH | PHASE |
| PIV | POST INDICATOR VALVE |
| PL | PILOT LIGHT |
| PLBG | PLUMBING |
| PM | PRESSURE MONITOR |
| PPH | POUNDS PER HOUR |
| PRESS | PRESSURE |
| PRS | PRESSURE REDUCING STATION |
| PRV | POWER ROOF VENTILATOR |
| PRV | PRESSURE REDUCING VALVE |
| PRV | POWER ROOF VENTILATOR |
| PSH | PRESSURE SWITCH HIGH |
| PSI | POUNDS PER SQUARE INCH |
| PSIA | POUNDS PER SQUARE INCH ATMOSPHERE |
| PSIG | POUNDS PER SQUARE INCH GAUGE |
| PSL | PRESSURE SWITCH LOW |
| PT | PRESSURE TRANSMITTER |
| PTAC | PACKAGED AIR TERMINAL AIR CONDITIONING |
| PWR | POWER |
| R | RISE |
| (R) | EXISTING, RELOCATED |
| RA | RETURN AIR |
| RAO | RETURN AIR OPENING |
| RC | REHEAT COIL |
| RCP | RADIANT CEILING PANEL |
| RE | REFRIGERANT ECONOMIZER |
| REC | RECESSED |
| RED | REDUCER |
| REF | RETURN/EXHAUST FAN |
| REL | REFRIGERANT/STEAM RELIEF |
| RF | RETURN FAN |
| RG | RETURN GRILLE |
| RH | RELATIVE HUMIDITY |
| RHG | REFRIGERANT HOT GAS |
| RL | REFRIGERANT LIQUID |
| RLA | RELIEF AIR |
| RM | ROOM |
| RO | REVERSE OSMOSIS |
| RPM | REVOLUTIONS PER MINUTE |
| RS | REFRIGERANT SUCTION |
| RTU | ROOFTOP UNIT |
| R-XXX | REFRIGERANT TYPE "XXX" TYPE |
| SA | SUPPLY AIR |
| SB | STEAM BOILER |
| SC | SPEED CONTROLLER |
| SC | SHADING COEFFICIENT |
| SCR | SILICONE CONTROLLED RECTIFIER |
| SD | SUPPLY DIFFUSER |
| SD | SMOKE DAMPER |
| SF | SUPPLY FAN |
| SF | SQUARE FOOT |
| SG | SUPPLY GRILLE |
| SM | SURFACE MOUNT |
| SOV | SHUT OFF VALVE |
| SP | STATIC PRESSURE |
| SP | SUMP PUMP |
| SPL | SOUND POWER LEVEL |
| SR | STEEL RADIATION |
| SSV | STEAM SAFETY VALVE |
| STM | STEAM |
| STR | STARTER |
| SW | SOFTENED WATER |
| SWR | SOLAR WATER RETURN |
| SWS | SOLAR WATER SUPPLY |
| SWSI | SINGLE WIDTH SINGLE INLET |
| T | THERMOSTAT |
| T.C.C. | TEMPERATURE CONTROL CONTRACTOR |
| TA | TRANSFER AIR |
| TAO | TRANSFER AIR OPENING |
| TC | TIME CLOCK |
| TCP | TEMPERATURE CONTROL PANEL |
| TD | TEMPERATURE DROP |
| TEAO | TOTALLY ENCLOSED AIR OVER |
| TEFC | TOTALLY ENCLOSED FAN COOLED |
| TEMP | TEMPERATURE |
| TF | TRANSFER FAN |
| TF | FREEZESTAT |
| TG | TRANSFER GRILLE |
| TOD | TOP OF DUCT |
| TOP | TOP OF PIPE |
| TS | TEMPERATURE SENSOR |
| TSP | TOTAL STATIC PRESSURE |
| TTS | TIGHT TO STRUCTURE |
| TYP | TYPICAL |
| UCD | UNDER CUT DOOR |
| UG | UNDERGROUND |
| UH | UNIT HEATER |
| UV | UNIT VENTILATOR |
| UV | ULTRA VIOLET |
| V | VOLTAGE |
| V | VENT |
| VAC | VACUUM |
| VAC | VACUUM |
| VAV | VARIABLE AIR VOLUME |
| VD | VOLUME DAMPER |
| VEL | VELOCITY |
| VENT | VENTILATION |
| VFD | VARIABLE FREQUENCY DRIVE |
| VRF | VARIABLE REFRIGERANT FLOW |
| W | WATT |
| WB | WET BULB |
| WC | WATER COLUMN |
| WCC | WATER-COOLED CHILLER |
| WCO | WALL CLEAN OUT |
| WFMS | WATER FLOW MEASURING STATION |
| WFR | WELL FIELD RETURN |
| WFS | WELL FIELD SUPPLY |
| WH | WALL HYDRANT |
| WH | WATER HEATER |
| WPD | WATER PRESSURE DROP |
| WSRV | WATER SAFETY RELIEF VALVE |
| WWM | WELDED WIRE MESH |

## DESIGN CONDITION

1. OUTDOOR DESIGN TEMPERATURES BASED ON WISCONSIN ADMINISTRATIVE CODE SPS 363 WEATHER DATA:
   A. WINTER: -10 DEGREES F.
   B. SUMMER: 89/77 DEGREES F.
   C. DEHUMIDIFICATION DP/MCDB AND HR: DB 82.6 DEGREES F, WB 76.7 DEGREES F, DP 73.9 DEGREES F, HR 129.8 GR/LB., RH 76.70%
   D. HOURS OF OCCUPANCY
      a. AIR HANDLING UNIT OPERATION HOURS MAY BE SCHEDULED OCCUPANCY THRU THE FMS.

## BUILDING ENVELOPE

1. BUILDING ENVELOPE WILL COMPLY WITH THE STATE OF WISCONSIN CODE (IHLAR 63) :
2. SPECIFIC CONSTRUCTION MATERIAL COEFFICIENTS AND U-VALUES TO BE DETERMINED. THE FOLLOWING COEFFICIENTS HAVE BEEN USED FOR PRELIMINARY CALCULATIONS:
   A. WALL CONSTRUCTION "U" = 0.06
   B. ROOF CONSTRUCTION "U" = 0.07
   C. ANY CURTAIN WALL CONSTRUCTION "U" = NA
   D. GLASS
      a. "SC" = 0.31
      b. "U" = 0.29
3. THE BUILDING HEAT LOSS WILL INCLUDE AN INFILTRATION LOAD FOR THE BUILDING BASED ON A 0.1 CFM/SF OF GROSS EXTERIOR WALL AREA.

## LIFE SAFETY REQUIREMENTS

1. ELECTRICAL CONTRACTOR SHALL FURNISH, INSTALL AND WIRE ALL SMOKE DETECTORS AS PART OF THE FIRE ALARM SYSTEM

## GENERAL NOTES

1. THE M.C. SHALL BE RESPONSIBLE FOR FIELD VERIFYING SCOPE OF WORK AND EXISTING CONDITIONS PRIOR TO FINAL BID.
2. DEMOLITION SHOWN IS BASED ON FIELD VERIFICATION OF EXISTING DRAWINGS. THE M.C. SHALL FIELD VERIFY EXISTING CONDITIONS AND EXTENT OF DEMOLITION WORK PRIOR TO BEGINNING ANY WORK. ANY ADDITIONAL ITEMS FOUND NEEDING TO BE DEMOLISHED THAT ARE NOT SHOWN ON THE PLANS SHALL BE REMOVED AT NO ADDITIONAL COST TO THE OWNER. REMOVE ALL UNUSED PIPING, DUCTWORK AND ACCESSORIES.
3. ALL ELECTRICAL AND TECHNOLOGY WORK REQUIRED FOR THE CONTROLS SYSTEM NOT SPECIFICALLY SHOWN ON THE ELECTRICAL DRAWINGS SHALL BE PROVIDED BY THE T.C.C. LOCATIONS FOR ADDITIONAL TEMPERATURE CONTROLS PANELS NOT SHOWN ON THE DRAWING SHALL BE REVIEWED AND COORDINATED WITH THE ENGINEER AND BUILDING OWNER, WITH POWER AND DATA REQUIREMENTS PROVIDED BY THE T.C.C.
4. IF THERE IS CONFLICTING INFORMATION IN THE BIDDING DOCUMENTS, INCLUDE THE COST FOR THE CONFLICT RESULTING IN THE HIGHEST FIRST COST.
5. PROVIDE GALVANIZED OR STAINLESS STEEL CONSTRUCTION MATERIALS FOR ALL SUPPORTS, HARDWARE, FASTENERS AND ISOLATORS LOCATED OUTDOORS.
6. HC SHALL COORDINATE ALL SYSTEM SHUT DOWN AND START-UP WITH OWNER PRIOR TO COMPLETING WORK.
7. COORDINATE CONSTRUCTION PHASING WITH OWNER AND CONSTRUCTION MANAGER.
8. CERTAIN AREAS OF THE BUILDING UTILIZE A RETURN AIR PLENUM. ALL MATERIALS IN PLENUM SPACES SHALL MEET NFPA 90 AND IMC 602.
9. CERTAIN OFFSETS ARE SHOWN IN THE DUCTWORK AND PIPING TO INDICATE THE GENERAL POSITION AND RELATIONSHIP OF THE SYSTEMS. PROVIDE ADDITIONAL OFFSETS, SIMILAR TO THOSE SHOWN, AS REQUIRED BY FIELD CONDITIONS.
10. ALL BRANCH DUCTWORK TAKEOFFS SHALL BE EXPANDED AT 45° ANGLE, FOR BOTH HORIZONTAL AND VERTICAL TAKEOFFS.
11. BRANCH DUCTWORK TO VAV BOXES SHALL BE SAME SIZE AS VAV BOX INLET CONNECTION, UNLESS SHOWN OTHERWISE. PROVIDE TRANSITIONS FROM VAV BOX OUTLETS TO DUCT SIZES AS SHOWN ON THE DRAWINGS. WHERE DUCT SIZE IS NOT LISTED DOWNSTREAM OF VAV BOX, DUCT SIZE SHALL BE SAME SIZE AS VAV BOX OUTLET.
12. CONTRACTOR MAY USE UP TO FIVE (5) FEET OF FLEXIBLE DUCT FOR CONNECTION OF EXHAUST GRILLES TO TOILET AND MISCELLANEOUS EXHAUST DUCTWORK. ONLY ONE (1) 90° BEND ALLOWED PER SECTION OF FLEX.
13. ALL FIRE DAMPERS SHALL BE TWO (2) HOUR RATED UNLESS NOTED OTHERWISE.
14. COORDINATE ALL DUCT AND PIPE CONNECTIONS REQUIRED FOR OWNER FURNISHED EQUIPMENT. PROVIDE DAMPERS, SHUTOFF VALVES, ETC. AS REQUIRED FOR COMPLETE INSTALLATION AND RECOMMENDED BY EQUIPMENT MANUFACTURER. VERIFY EXACT REQUIREMENTS WITH EQUIPMENT MANUFACTURER.
15. SEE PROJECT MANUAL FOR SPECIFICATIONS AND OTHER CONTRACT REQUIREMENTS.
16. INSTALL ALL HVAC WORK TO BEST SUIT FIELD CONDITIONS; DRAWINGS ARE DIAGRAMMATIC AND SHALL NOT BE SCALED TO DETERMINE EXACT LOCATION.
17. EXPOSED PIPING AND DUCTWORK IN OCCUPIED SPACES IS PROHIBITED. (EXCEPT FOR ROOMS WITHOUT SUSPENDED CEILINGS, OR WHERE NOTED ON THE DRAWINGS.)
18. FOR AREAS OF THE PROJECT THAT HAVE EXPOSED STRUCTURE, COORDINATE INSTALLATION OF DUCTWORK AND PIPING WITH STRUCTURE, LIGHT FIXTURES, AND WORK OF OTHER TRADES. PROVIDE OFFSETS AND TRANSITIONS AS REQUIRED, MAINTAIN MAXIMUM CLEARANCE BELOW WORK AS POSSIBLE.
19. WORK IN EXPOSED AREAS SHALL BE FREE OF DEFECTS, DENTS, MISALIGNMENTS ETC. INSTALL WORK LEVEL AND IN A NEAT MANNER FOR EXPOSED APPLICATION. COORDINATE HEIGHT OF DIFFUSERS WITH LIGHT FIXTURES FOR A LEVEL CEILING PLANE.
20. COORDINATE ALL FINAL THERMOSTAT LOCATIONS WITH THE ARCHITECT AND OWNER.
21. MAXIMUM DUCT ASPECT RATIO SHALL BE 4:1, EXCEPT WHERE BUILDING CONSTRAINTS DO NOT ALLOW. FOR ALL DUCTWORK WITH ASPECT RATIOS GREATER THAN 4:1 PROVIDE ADDITIONAL REINFORCEMENT AND STIFFENERS TO PREVENT EXCESSIVE VIBRATIONS, PULSATIONS, BOWING, CONCAVING, AND PREMATURE FAILURE.
22. SEE ARCHITECTURAL REFLECTED CEILING PLANS FOR ALL FINAL LOCATIONS OF CEILING GRILLES AND DIFFUSERS, AND CEILING TYPES.
23. AVOID BLOCKING RETURN AIR TRANSFER PATHWAYS WITH DUCTWORK AND PIPING.
24. ALL DUCTWORK SHALL BE CONSTRUCTED OF SHEETMETAL EXCEPT FOR FLEXIBLE BRANCH DUCTS. DUCT DIMENSIONS ON PLANS FOR THE SUPPLY, RETURN, EXHAUST AND TRANSFER DUCTWORK ARE THE INTERIOR FREE AREA DIMENSIONS, WHICH DO NOT INCLUDE LINING, INSULATION OR REINFORCEMENT. ADJUST STHEET METAL SIZE FOR DUCT LINING WHERE APPLICABLE.
25. BRANCH DUCTWORK TO GRILLES AND DIFFUSERS SHALL BE THE SAME SIZE AS THE INLET CONNECTIONS UNLESS NOTED OTHERWISE ON THE DRAWINGS. PROVIDE TRANSITIONS FOR TAKEOFFS FROM BRANCH DUCTWORK TO GRILLES AND DIFFUSERS AS REQUIRED. SEE GRILLE AND DIFFUSER SCHEDULES FOR INLET SIZES.
26. CONTRACTOR SHALL LOCATE THERMOSTATS AND TEMPERATURE SENSORS PER ADA REQUIREMENTS, AND ALIGN HORIZONTALLY WITH LIGHT SWITCHES AND OTHER DEVICES.
27. ALL SUPPLY, RETURN, AND EXHAUST DUCTWORK SHALL BE RATED FOR PRESSURE CLASS AS INDICATED IN THE SPECIFICATIONS.
28. PROVIDE DIFFUSERS AND REGISTERS WITH 4-WAY BLOW PATTERN UNLESS OTHERWISE NOTED.
29. PROVIDE A MIN. 4" HOUSEKEEPING PAD FOR EACH PIECE OF MECHANICAL EQUIPMENT. COORDINATE SIZES WITH MECHANICAL EQUIPMENT SELECTED.
30. THE CONTRACTOR SHALL BE REQUIRED TO REPLACE FILTERS ON HVAC EQUIPMENT AFTER ALL DUST PRODUCING CONSTRUCTION HAS BEEN COMPLETED AND PRIOR TO THE FINAL PUNCH. ALL EQUIPMENT AND DUCTWORK UTILIZED DURING CONSTRUCTION SHALL BE THOROUGHLY CLEANED PRIOR TO USE WITH REPLACED FILTERS.
31. T.C.C SHALL COORDINATE ALL FINAL DEHUMIDIFICATION CONTROL SENSOR LOCATIONS WITH EQUIPMENT, MANUF. AND OWNER.
32. FINAL PRODUCT SHALL BE A COMPLETE AND FUNCTIONING SYSTEM, AND SHALL CONFORM TO ALL REQUIREMENTS OF APPLICABLE FEDERAL, STATE, AND LOCAL CODES, INCLUDING BUT NOT LIMITED TO THE INTERNATIONAL BUILDING CODE AND INTERNATIONAL MECHANICAL CODE.
33. LOCATE EQUIPMENT REQUIRING ACCESS 2'-0" MAXIMUM ABOVE CEILING.
34. ALL ROOF MOUNTED EQUIPMENT SHALL BE A MINIMUM 10'-0" FROM EDGE OF ROOF.
35. LOCATE DUCTWORK, PIPING AND MECHANICAL EQUIPMENT AWAY FROM THE SPACE ABOVE ELECTRICAL PANELS, TRANSFORMERS, AND OTHER ELECTRICAL EQUIPMENT. PER NEC REQUIREMENTS.
36. PENETRATIONS OF RATED ASSEMBLIES SHALL BE FIRE STOPPED. FIRE STOPPING SHALL BE AN APPROVED MATERIAL AS PRESCRIBED IN CSFM STANDARD 43-1 AND SHALL BE U.L. LISTED. SEE ARCHITECTURAL SPECIFICATIONS.
37. PROVIDE SLEEVES AND/OR OPENINGS TO RUN PIPES AND DUCTS THROUGH FOUNDATIONS, FLOORS, WALLS, AND ROOF.
38. MAINTAIN CLEAR ACCESS TO SERVICE EQUIPMENT AND OTHER ACCESSORIES REQUIRING SERVICE, VISUAL INSPECTION OR HAND OPERATION. WHERE INDICATED OR REQUIRED, PROVIDE ACCESS PANELS OF THE TYPE SELECTED TO SUIT MATERIALS IN WHICH INSTALLED.
39. INSTALL ALL EQUIPMENT IN ACCORDANCE WITH THE RESPECTIVE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS, AT A LEVEL OF QUALITY AND WORKMANSHIP CONSISTENT WITH THE SPECIFICATIONS.
40. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND SHALL ARRANGE FOR ALL INSPECTIONS AS REQUIRED.
41. PROVIDE MANUAL VOLUME DAMPERS IN ALL BRANCH DUCTS SERVING SUPPLY, RETURN, AND EXHAUST GRILLES, AND WHERE REQUIRED TO ACHIEVE PROPER BALANCING, AS DIRECTED BY THE TAB CONTRACTOR. ELEVATED PLATFORMS SHALL BE INSTALLED ON ANY INSULATED DUCTWORK.
42. PROVIDE WIRE MESH SCREENS FOR ALL OPEN ENDED DUCTS AND TRANSFER DUCT OPENINGS LOCATED IN EXPOSED AREAS WHERE GRILLES ARE NOT INDICATED.
43. SEAL ALL PIPING AND DUCTWORK PENETRATIONS AIR TIGHT THRU WALLS, FLOORS, OR PARTITIONS IDENTIFIED AS SOUND WALLS, SMOKE TIGHT WALLS, FIRE BARRIERS, SMOKE BARRIERS, SHAFTS, OR FIRE RATED CONSTRUCTION INDICATED ON THE ARCHITECTURAL DRAWINGS. MAINTAIN ALL DESIGNATED FIRE RATINGS, SMOKE RATINGS, AND UL LISTINGS.
44. PROVIDE ACCESS PANELS IN DUCTWORK, WALLS, AND CEILINGS FOR ACCESS TO ALL CONCEALED TURNING VANES, CONTROL DAMPERS, SMOKE DETECTORS, CONTROLS, CONTROL VALVES, SHUT-OFF VALVES, AIR VENTS, AIR TERMINALS, EXPANSION COMPENSATING DEVICES, HEATING COILS, COOLING COILS, BOOSTER COILS, FILTERS, FANS, AND EQUIPMENT.
45. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES, SIZES, CAPACITIES, ACCESSORIES, SEQUENCES, MATERIALS, MEANS AND METHODS, SPACE REQUIREMENTS, ACCESSIBILITY, CODE CLEARANCES, PERFORMANCE, FABRICATION PROCESSES, AND TECHNIQUES OF CONSTRUCTION. THE CONTRACTOR SHALL COORDINATE ALL WORK WITH THAT OF ALL OTHER TRADES, AND PERFORM ALL WORK IN A SAFE MANNER. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR DESIGN/BUILD CHANGES, EQUIPMENT SUBSTITUTIONS, AND VALUE ENGINEERING CHANGES PERFORMED BY THE CONTRACTOR.
46. PROVIDE ALL OPENINGS FOR HVAC WORK. PROVIDE LINTELS FOR ALL HVAC OPENINGS IN ACCORDANCE WITH REQUIREMENTS SHOWN ON THE STRUCTURAL DRAWINGS.
47. DESIGN OF ALL HVAC SUPPORTS AND DUCT LINTELS IS THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR.
48. BRANCH PIPING TO FINNED PIPE RADIATION SHALL BE 1/2" UNLESS NOTED OTHERWISE ON THE DRAWINGS.
49. LOCATE BRANCH SHUT-OFF VALVES WITHIN 3 FEET OF COILS SERVED.
50. INSTALL ALL SHUT-OFF VALVES, CONTROL VALVES, STRAINERS, DRAIN VALVES, AIR VENTS, AND ACCESSORIES IN ACCESSIBLE LOCATIONS.
51. CONDENSATE DRAINS SHALL BE SUPPLIED FOR ALL COOLING EQUIPMENT. CONTRACTOR SHALL ENSURE PROPER INSTALLATION AND DRAINAGE AS REQUIRED BY FEDERAL, STATE, AND LOCAL CODES. PITCH ALL CONDENSATE DRAIN PIPING AT A MINIMUM 1" PER 40 FEET AS REQUIRED BY APPLICABLE CODES, OR AS INDICATED ON DRAWINGS. PROVIDE CLEANOUT AT END OF PIPE MAINS AND CHANGES IN DIRECTION.
52. ALL DUCT SMOKE DETECTORS PROVIDED BY E.C. COORDINATE LOCATIONS AND REQUIREMENTS WITH E.C.
53. PROVIDE ALL CUTTING, PATCHING AND SEALING REQUIRED FOR ALL NEW HVAC WORK. PATCHING SHALL MATCH EXISTING ADJACENT SURFACE MATERIALS.
54. ALL DUCTWORK & PIPING INSULATION DAMAGED DURING CONSTRUCTION OR OTHERWISE SHALL BE PATCHED TO MATCH EXISTING AND MAINTAIN INSULATION VAPOR BARRIER.

* NOTE *

ALL OF GENERAL NOTES ON THIS SHEET ARE TO BE APPLIED TO ALL OTHER DRAWINGS IN THIS SET.THE SYMBOLS AND ABBREVIATIONS SHOWN ON THIS SHEET MAY OR MAY NOT BE USED IN THIS SET OF DRAWINGS.

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 / Fax: 414.778.2360 / r-d@ringdu.com
RD Project Number: 223003.00

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No. 223010.00 — CITY OF WAUWATOSA

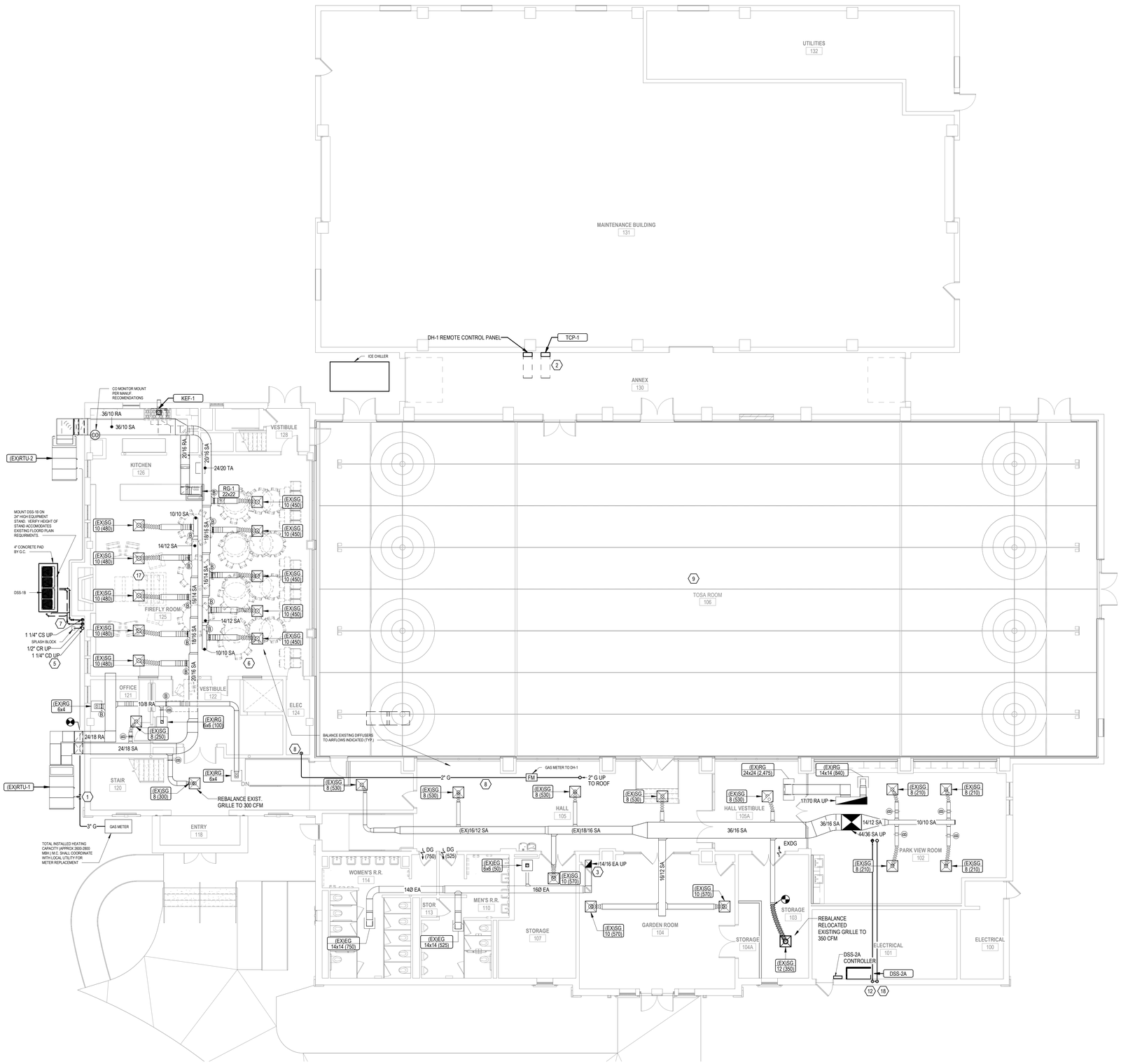
Sheet Title
MECHANICAL NOTES AND ABBREVIATIONS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
M001

12/19/2023 1:31:17 PM




1 FIRST FLOOR MECHANICAL PLAN
1/8" = 1'-0"

**KEYED NOTES:**

1. RECONNECT EXIST. GAS PIPING ASSOC. WITH EXRTU-1
2. CODE REQUIRED ELECTRICAL CLEARANCE.
3. NEW EXHAUST AIR SMOKE DUCT DETECTOR BY E.C.
4. REFRIGERANT PIPING FROM INDOOR UNITS TO OUTDOOR CONDENSING UNIT DSS-1B SIZES AND MAX. REFRIGERANT LINE LENGTHS AS RECOMMENDED BY UNIT MANUFACTURER.
5. 1-1/4" COOLING COIL CONDENSATE DRAIN LINE. ROUTE CONDENSATE OUTDOORS TO GRADE. TERMINATE DRAIN LINE AT SPLASH BLOCK. PITCH ALL HORIZONTAL PIPING TOWARDS VERTICAL DRAIN PIPE TERMINATING AT GRADE. FIELD VERIFY EXACT DRAIN TERMINATION. SPLASH BLOCK PROVIDED BY M.C.
6. CLEAN ALL EXISTING DUCTWORK AND GRILLES PRIOR TO REINSTALLATION. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
7. COVER ALL INTERIOR AND EXTERIOR REFRIGERANT PIPING WITH LINE HIDE SET COVER SYSTEM.
8. NEW 2" GAS PIPE. RUN NEW PIPING PARALLEL TO EXISTING 1-1/2" LINE. FOLLOW EXISTING GAS PIPING ROUTING BACK TO METER CONNECTION POINT INDICATED.
9. LOCATE TEMPERATURE AND DEW POINT SENSOR LOCATION PER HUMIDIFICATION MANUFACTURES RECOMMENDATIONS, TO INSURE OPTIMAL PERFORMANCE.

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
FIRST FLOOR MECHANICAL PLAN

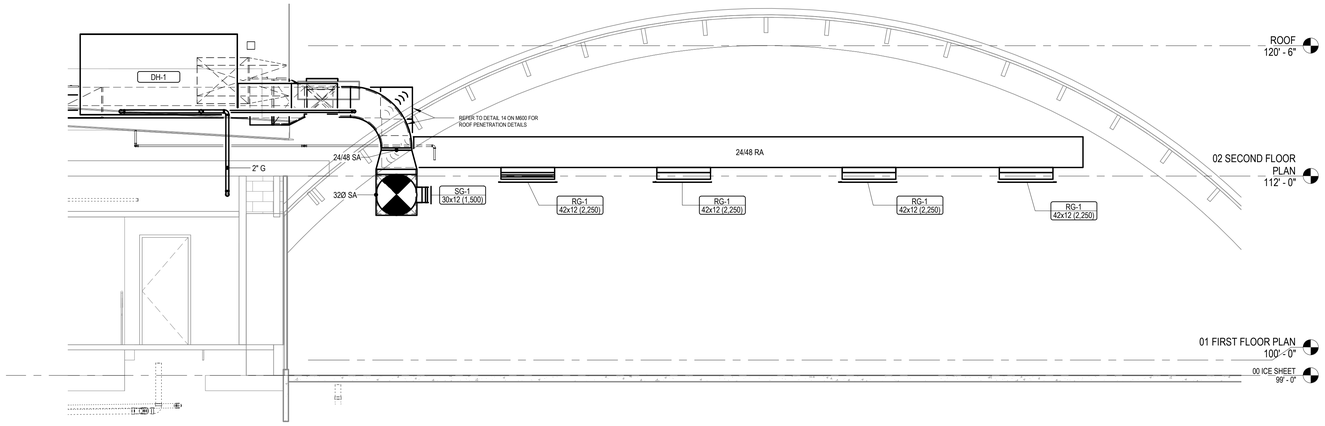
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

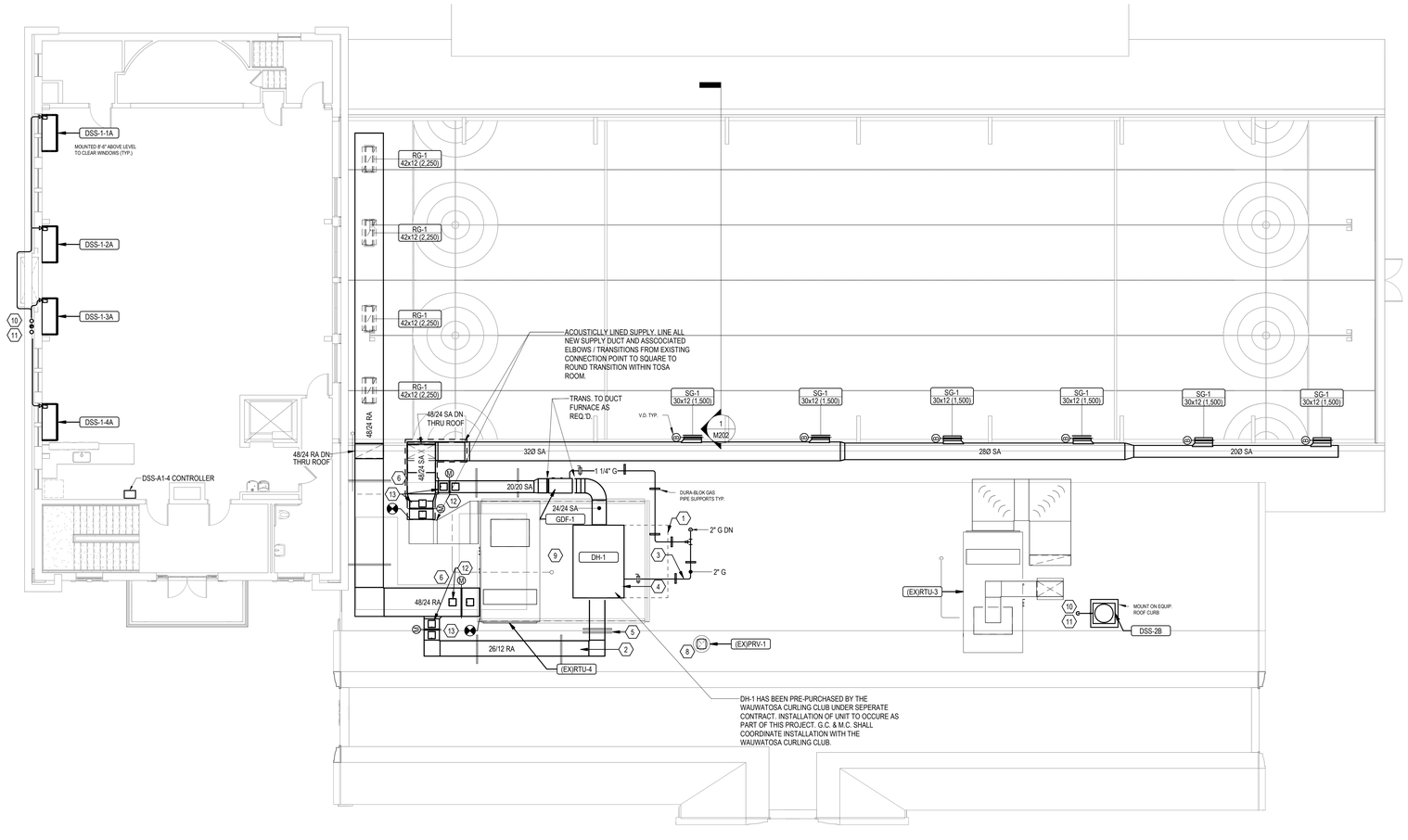
Sheet No.
M201

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00




1 Section 43
1/4" = 1'-0"




2 SECOND FLOOR MECHANICAL PLAN
1/8" = 1'-0"

**KEYED NOTES:**

1. MANUFACTURE REQUIRED CLEARANCES.
2. ALL EXTERIOR DUCTWORK SHALL BE JACKETED PER INSULATION SPECIFICATION 23 07 13.
3. NEW GAS PIPING TO DH-1. INSTALL PER MANUFACTURES REQUIREMENTS. M.C. SHALL PROVIDE GAS REGULATOR AS REQUIRED. PROVIDE PIPE SUPPORTS PER SPECIFICATION 23.05.29
4. NEW EQUIPMENT ROOF SUPPORT RAILS FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR. MOUNT TO TOP OF EXISTING ROOF RTU SUPPORT RAILS.
5. DUCT ROOF SUPPORT SYSTEM (TYP.) SEE DETAIL ON SHEET M600 AND SPECIFICATION SECTION 23.05.29 FOR FURTHER REQUIREMNTS.
6. DUCT MOUNTED SUPPLY AND RETURN AIR SMOKE DUCT DETECTORS PROVIDED BY, INSTALLED BY, AND WIRED BY E.C. INSTALL / MOUNT PER MFR'S REQUIREMENTS. SEE SPECIFICATION 23 09 93 - SMOKE DETECTION SYSTEM FOR FURTHER INFORMATION.
7. CODE REQUIRED ELECTRICAL CLEARANCE.
8. NEW EXHAUST AIR SMOKE DUCT DETECTOR BY E.C.
9. ALL SUPPLY AND RETURN DUCTWORK SERVING (EX)RTU-4 & DH-1 SHALL BE INTERNALLY LINED. DUCT SIZES REFLECTED ARE CLEAR INSIDE DIMENSIONS.
10. REFRIGERANT PIPING FROM INDOOR UNITS TO OUTDOOR CONDENSING UNIT CU-1 SIZES AND MAX. REFRIGERANT LINE LENGTHS AS RECOMMENDED BY UNIT MANUFACTURER.
11. 1-1/4" COOLING COIL CONDENSATE DRAIN LINE. ROUTE CONDENSATE OUTDOORS TO GRADE. TERMINATE DRAIN LINE AT SPLASH BLOCK. PITCH ALL HORIZONTAL PIPING TOWARDS VERTICAL DRAIN PIPE TERMINATING AT GRADE. FIELD VERIFY EXACT DRAIN TERMINATION. SPLASH BLOCK PROVIDED BY M.C.
12. MOTORIZED ISOLATION DAMPERS AND ASSOCIATED 24"x24" ACCESS PANELS.
13. PROVIDE NEMA 4 WEATHERTIGHT ENCLOSURES FOR DAMPER ACTUATORS AND WEATHERTIGHT ACCESS PANELS.

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
SECOND FLOOR MECHANICAL PLAN

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

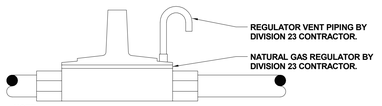
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
M202

12/19/2023 1:31:01 PM

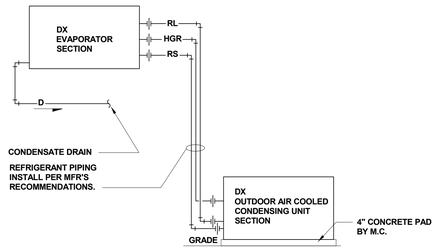
Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | c-d@ringdu.com
RD Project Number: 223003.00

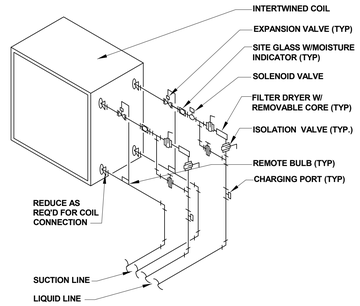



NOTE:
1. IF THE NATURAL GAS REGULATOR IS INSTALLED IN THE UPRIGHT POSITION, A J-PIPE SHALL BE INSTALLED TO PREVENT RAIN FROM ENTERING VENT OPENING.

## 12 NATURAL GAS PIPING SCHEMATIC
NO SCALE

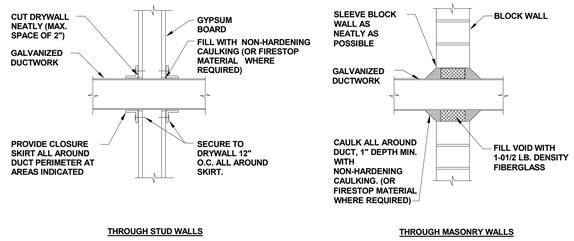



## 9 DX INDOOR UNIT AND AIR COOLED CONDENSING UNIT DETAIL
NO SCALE



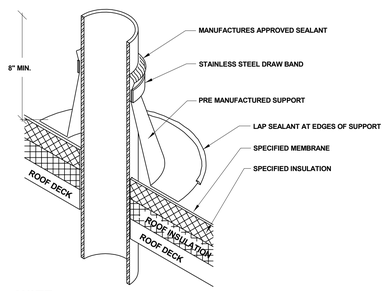

NOTE: DETAIL AOVE DOES NOT REFLECT HOT GAS REHEAT PIPING OR ASSOCIATED COMPONENTS. SEE MANUFACTURES SCHEMATIC DIAGRAM FOR FIELD INSTALLED HOT GAS REHEAT PIPING.

## 5 DX COOLING COIL PIPING DETAIL
NO SCALE




NOTES:
- DETAILS APPLY TO ALL DUCTWORK (SUPPLY, RETURN, EXHAUST, TRANSFER, ETC.). PASSING THROUGH ANY BUILDING WALL OR PARTITION UNLESS SPECIFICALLY SHOWN OR DETAILED OTHERWISE.

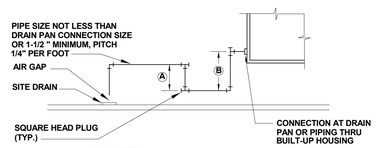
## 1 DUCTWORK THROUGH INTERIOR WALLS & PARTITIONS DETAIL
NO SCALE




NOTE:
1. FOR SLOPED ROOFS, CURB SHALL BE FURNISHED SUCH THAT TOP OF SUPPORT IS LEVEL.
2. PROVIDE WHERE CONDENSER, OVERFLOW SUMP SWEEPER AND DRAIN PIPING PENETRATES ROOF.

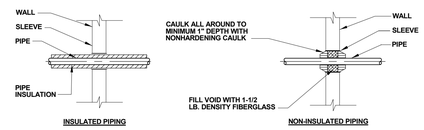
## 13 PIPE PENETRATION DETAIL
NO SCALE

| CONDENSATE DRAIN PIPING DATA | | | | |
|---|---|---|---|---|
| EQUIP. NO. | COMPONENT | A | B | REMARKS |
| DDS-A1-4 | COOLING COIL (DX) | PER MFR. RECOMMENDATIONS | | PER MFR. RECOMMENDATIONS |
| DU-1 | REACT. DRAIN | PER MFR. RECOMMENDATIONS | | PER MFR. RECOMMENDATIONS |



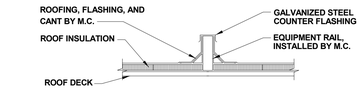

NOTES:
1. FILL TRAP MANUALLY ON INITIAL START-UP.
2. TRAP EACH COMPONENT DRAIN CONNECTION.
3. TRAPS PROVIDED BY M.C.
4. TYP. OF TWO (2) REACT. DRAINS.

## 10 CONDENSATE DRAIN TRAP PIPING DETAIL
NO SCALE



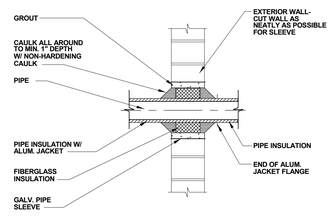

NOTE:
- PROVIDE ESCUTCHEON PLATES FOR ALL PIPES PASSING THROUGH FINISHED WALLS, FLOORS, AND CEILINGS.
- PIPE SLEEVE IN MECH. ROOMS SHALL EXTEND MIN. 6" ABOVE FLOOR SURFACE.

## 6 PIPING PENETRATION DETAIL- NON-RATED WALLS & FLOORS
NO SCALE

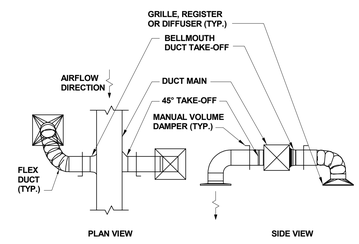



NOTES:
- RAIL USED FOR EQUIPMENT, DUCT, AND PIPE SUPPORT. ATTACH DUCT AND PIPE SUPPORT TO TOP OF RAIL.
- FOR SLOPED ROOFS, CURB SHALL BE FURNISHED SUCH THAT TOP OF CURB IS LEVEL.

## 2 ROOF SUPPORT RAIL DETAIL
NO SCALE

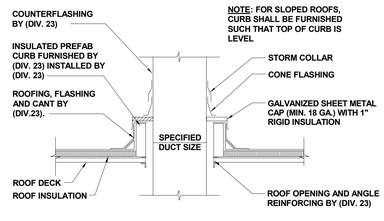



## 7 PIPING THRU EXTERIOR WALL DETAIL
NO SCALE

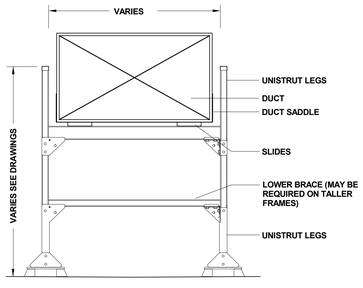



NOTE:
- PROVIDE MANUAL VOLUME DAMPERS IN ALL BRANCH DUCTS SERVING SUPPLY, RETURN AND EXHAUST DUCT TAKE-OFFS FOR EACH GRILLE, REGISTER OR DIFFUSER.
- BALANCE GRILLES, REGISTERS AND DIFFUSERS TO AIRFLOWS SHOWN ON DRAWINGS.

## 3 MANUAL VOLUME DAMPER DETAIL
NO SCALE




## 14 DUCT THROUGH ROOF CURB DETAIL
NO SCALE

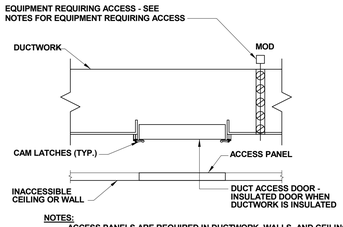



**DUCT SUPPORT SYSTEMS DESIGN WILL VARY BY MANUFACTURE. DETAIL REFLECTED ABOVE MAY BE VISUALLY DIFFERENT FROM CONTENT CONTAINED WITHIN THE DESIGN MODEL.**

DUCT SUPPORT MANUFACTURE BASIS OF DESIGN: MIRO INDUSTRIES ROOFTOP SUPPORT PRODUCTS

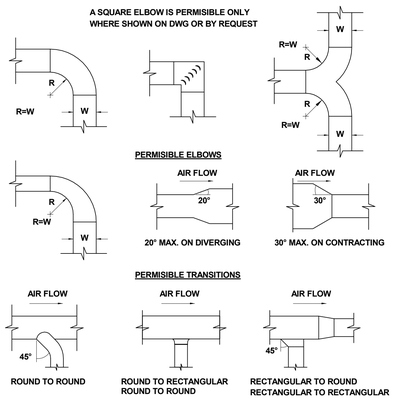
NOTES:
1. SUPPORT RAILS SHALL BE OF HEAVY GA. GALVANIZED STEEL, UNITIZED CONSTRUCTION WITH INTERNAL BASE PLATE, CONTINUOUS WELDED CORNER SEAMS, PRESSURE TREATED WOOD NAILER, COUNTERFLASHING WITH SCREWS. INTERNALLY RE-INFORCED TO CONFORM WITH SUPPORT MANUFACTURES LOAD BEARING FACTORS.
2. DUCT MOUNTING HARDWARE SHALL INCLUDE UNISTRUT LEGS, SUPPORT SADDLE AND SLIDES TO ALLOW FOR DUCT MOVEMENT, VERTICAL AND HORIZONTAL ADJUSTMENT.
3. SUPPORT SPACING PER MANUFACTURES REQUIREMENTS.
4. SEE SPECIFICATIONS FOR ADDITIONAL SUPPORT REQUIREMENTS.

## 11 DUCT ROOF SUPPORT SYSTEM DETAIL
NO SCALE




NOTES:
- ACCESS PANELS ARE REQUIRED IN DUCTWORK, WALLS, AND CEILINGS FOR ACCESS TO ALL CONCEALED FIRE, SMOKE, & FIRE/SMOKE DAMPERS, TURNING VANES, CONTROL DAMPERS, BACKDRAFT DAMPERS, SMOKE DETECTORS, CONTROLS, CONTROL VALVES, SHUT-OFF VALVES, AIR VENTS, AIR TERMINALS, EXPANSION COMPENSATING DEVICES, HEATING COILS, COOLING COILS, BOOSTER COILS, FILTERS, FANS, HUMIDIFIER DISPERSION TUBES AND EQUIPMENT.
- PROVIDE TWO ACCESS PANELS WHEN DUCTWORK WIDTH IS 60" OR GREATER.
- DETAIL APPLIES TO SUPPLY, RETURN, EXHAUST & OUTSIDE AIR DUCTWORK.

## 8 ACCESS DETAIL
NO SCALE




## 4 PERMISIBLE DUCT BRANCH TAKEOFF
NO SCALE

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No. 223010.00
CITY OF WAUWATOSA

Sheet Title
MECHANICAL DETAILS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
M600

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00

## EQUIPMENT ELECTRICAL SCHEDULE

| EQUIPMENT | | | ELECTRICAL DATA | | | | | | | | | MOTOR CONTROLLER | | | | | | | DISCONNECT AT EQUIPMENT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | EMERGENCY POWER | | | | | | | | | | | | | | |
| SYMBOL | TYPE | LOCATION | V/PH | HP | KW | FLA | MCA | MOP | YES | NO | STANDBY | LOCATION | TYPE | DISCONNECT | VFD RESTART | FURN. BY | INST. BY | ACCESSORIES | TYPE | FURN. BY | INST. BY | REMARKS |
| DH-1 | ICE HOUSE DEHUMIDIFICATION UNIT | ROOF | 460/3 | - | - | 14.4 | 18 | 25 | | X | - | ANNEX | | | | MFR. | | | (OUTDOOR) (NF) | EC | EC | SEE NOTE 1 BELOW |
| | | | | | | | | | | | | | | | | | | | | | | - |
| DF-1 | GAS-FIRED DUCT FURNACE | ROOF | 120/1 | - | - | 1.68 | - | - | - | X | - | INTEGRAL | MAGNETIC | YES | - | MFR. | MFR. | - - - | (OUTDOOR) (NF) | EC | EC | - |
| | | | | | | | | | | | | | | | | | | | | | | - |
| DSS-1A | DUCTLESS SPLIT SYSTEM (INDOOR UNIT) | RIVER ROOM | 208/3 | - | - | - | 1.4 | 15 | | X | - | NEAR UNIT | MANUAL | YES | - | MFR. | MFR. | - - - | (INDOOR) (NF) | EC | EC | SEE NOTES 2 & 4 BELOW |
| DSS-1B | DUCTLESS SPLIT SYSTEM (OUTDOOR UNIT) | SEE DRAWINGS | 208/3 | - | - | 23.9 (RLA) | 60.8 | 70 | - | X | - | INTEGRAL | MAGNETIC | YES | - | MFR. | MFR. | - - - | (OUTDOOR) (NF) | EC | EC | SEE NOTES 3 BELOW |
| | | | | | | | | | | | | | | | | | | | | | | |
| DSS-2A | DUCTLESS SPLIT SYSTEM (INDOOR UNIT) | ELEC. RM 101 | 208/3 | - | 64 (WATTS) | 0.37 | - | - | | X | | NEAR UNIT | MANUAL | YES | - | MFR. | MFR. | - - - | (INDOOR) (NF) | EC | EC | SEE NOTES 1 & 4 BELOW |
| DSS-2B | DUCTLESS SPLIT SYSTEM (OUTDOOR UNIT) | ROOF | 208/3 | - | - | 16.25 (RLA) | 17 | - | - | X | | INTEGRAL | MAGNETIC | YES | - | MFR. | MFR. | - - - | (OUTDOOR) (NF) | EC | EC | - |
| | | | | | | | | | | | | | | | | | | | | | | - |
| TCP-1 | TEMPERATURE CONTROL PANEL | ANNEX | 120/1 | 20 AMP CIRCUIT | | | | | - | X | - | - | - | - | - | - | - | - - - | (INDOOR) (NF) | EC | EC | PROVIDE W/ DATA JACK (BY E.C.) |
| | | | | | | | | | | | | | | | | | | | | | | |

**ABBREVIATIONS:**

MC MECHANICAL CONTRACTOR
EC ELECTRICAL CONTRACTOR
MFR. MANUFACTURER
TCC TEMPERATURE CONTROL CONTRACTOR
FLA FULL LOAD AMPS
MCA MIN. CIRCUIT AMPS
MOP MAX. OVERCURRENT PROTECTION
VFD VARIABLE FREQUENCY DRIVE
MCC MOTOR CONTROL CENTER

**ACCESSORIES:**

(HOA) HAND-OFF-AUTO
(PL) PILOT LIGHT
(PB) PUSH BUTTON

**DISCONNECT TYPE:**

(OUTDOOR) WEATHER PROOF
(INDOOR) NON-WEATHER PROOF
(F) FUSED
(NF) NON-FUSED

(1) UNIT IS SINGLE-POINT POWER.
(2) TYPICAL OF FOUR (INDOOR UNITS) DESIGN CRITERIA IS PER INDOOR UNIT.
(3) TYPICAL OF TWO (OUTDOOR UNITS) DESIGN CRITERIA IS PER OUTDOOR UNIT.
(4) INDOOR UNITS POWERED FROM OUTDOOR UNITS.

## DESICCANT DEHUMIDIFICATION SYSTEM SCHEDULE (DH-1)

| | | | SUPPLY AIR | | | | | REACTIVATION AIR | | | | | DIRECT FIRED | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TAG | SERVICE | LOCATION | CFM | TSP | RPM | BHP | HP | CFM | ESP | FAN RPM | BHP | HP | GAS PRESS. (W.C.) | FUEL TYPE | MAX. REACT. MBH | MANIFOLD PRESS. | DESICCANT MATERIAL | MANUFACTURER | MODEL | REMARKS |
| DH-1 | TOSA ROOM | ROOF | 5,000 | 2.0" W.C. | 3,510 | 6.77 | 7.5 | 1,350 | 0" W.C. | 3,600 | 1.81 | 3.0 | 7"-14" | NATURAL GAS | 359.0 | 1.9" | SILICA GEL | "CLIMATE BY DESIGN" | CDH-138 | SEE NOTES BELOW |
| | | | | | | | | | | | | | | | | | | | | |

(1) UNIT DESIGN CONDITIONS: SUMMER: 82.6 ° F DB | 76.7° F WB | 129.8 GR/LB | RH 74.70% WINTER: -10 °F
(2) PROVIDE BACNET INTERFACE FOR MONITOR AND ALARM. SEE SPECIFICATION FOR UNIT CONTROLS.
(3) FILTERS - SUPPLY: MERV 8, QTY: THREE (3) 20x24x2 | REACTIVATION: MERV 8, QTY: ONE (1) 20x20x2.
(4) SEE SPECIFICATIONS FOR UNIT OPTIONS.
(5) MINIMUM 0A=300 DURING OCCUPIED MODE.
(6) UNIT INCLUDES COIL SECTION FOR FUTURE POST COOLING. DURING SUMMER OPERATING CONDITIONS, THE INTENT OF DESIGN IS TO UTILIZE THE COOLING MASS OF THE ICE SHEET. SUMMER RINK DRY BULB TEMPERATURE RANGE SHALL BE MAINTAINED BETWEEN 40°-45° F (ADJ.).
(7) SEE OUTDOOR GAS-FIRED DUCT FURNACE SCHEDULE FOR POST HEAT INFORMATION.
(8) UNIT HAS BEEN PRE-PURCHASED BY THE WAUWATOSA CURLING CLUB. SCHEDULE FOR REFERENCE ONLY.

## GAS DUCT FURNACE SCHEDULE (G.D.F.)

| NO. | SERVES | TOTAL CFM | EAT (°F) | LAT (°F) | TEMP. RISE | INPUT CAPACITY (MBH) | APD | OUTPUT CAPACITY (MBH) | GAS PRESSURE (IN. W.C.) | BURNER TYPE | CONTROL | MODEL | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | DH-1 | 5,000 | 34 | 56.5 | 22.5 | 150 | 0.4 | 121.5 | 7-14" | TWO STAGE, 4:1 TURNDOWN | SEE NOTE BELOW | MODINE HFP150 | SEE NOTES 1, 2,3, 4, & 5 BELOW |
| | | | | | | | | | | | | | |

(1) UNIT SHALL BE PROVIDED WITH 409 STAINLESS STEEL HEAT EXCHANGER.
(2) M.C. SHALL PROVIDE GAS REGULATOR AS REQUIRED.
(3) MOUNT UNIT PER UNIT MANUFACTURES INSTALLATION RECOMMENDATIONS.
(4) POWER VENTED: 120/1, 1.68 AMPS

## DUCTLESS SPLIT SYSTEM AIR CONDITIONING UNIT SCHEDULE (D.S.S.)

| | | | | | INDOOR UNIT (A) | | | | OUTDOOR UNIT (B) | | | | | | | REFRIG. TUBING | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NO. | SERVES | TOTAL RATED COOLING CAP. (MBH) | TOTAL RATED COOLING CAP. (MBH) | SENS. TONS | RATED HEATING CAP. (MBH) | CFM RANGE (H/ L/OW) | MCA | MOP | MODEL | COMP. TYPE | (TOTAL SYSTEM) RATED HEATING CAP. (MBH) | (TOTAL SYSTEM) RATED COOLING CAP. (MBH) | RLA | MCA | MOP | MODEL | MAX. LENGTH (FT) | MAX. LIFT (FT) | RS SIZE (IN.) | RL SIZE (IN.) | MANUFACTURE | REMARKS |
| 1 | RIVER ROOM | 36.0 | 25.1 | 3.0 | 40.0 | 830(H) 670 (L) | 1.4 | 15 | FXHQ36MVJU (SEE NOTE # 2BELOW) | VARIABLE SPEED - INVERTER | 154 | 144 | 23.9 | 60.8 | 70 | RXLQ144TATJA (SEE NOTE #3 BELOW) | SEE NOTE # 6 | SEE NOTE # 6 | SEE NOTE # 6 | SEE NOTE #6 | DAIKIN | SEE NOTES BELOW |
| 2 | ELEC. 101 | 34.0 | 22.2 | 3.0 | - | 915(H) 572 (L) | - | - | FTX36NVJU | VARIABLE SPEED - INVERTER | - | 34.4 | 16.3 | 17.0 | 20 | RK36NMVJU | SEE NOTE # 6 | SEE NOTE # 6 | SEE NOTE # 6 | SEE NOTE #6 | DAIKIN | SEE NOTES 1, 4, 5, 6, 7, 8, 9, 10,12,14,15 |
| | | | | | | | | | | | | | | | | | | | | | | |

(1) CAPACITY DATA IS AT AHRI CONDITIONS.
(2) TYPICAL OF FOUR (INDOOR UNITS) DESIGN CRITERIA IS PER INDOOR UNIT.
(3) TYPICAL OF TWO (OUTDOOR UNITS) DESIGN CRITERIA IS PER OUTDOOR UNIT. UNLESS OTHERWISE NOTED.
(4) REFRIGERANT TYPE IS R-410A.
(5) REFRIGERANT PIPE SIZES AND MAX. LENGTHS AND MAX. VERTICAL SEPARATION BY MANUFACTURE. CONTRACTOR SHALL CONFIRM PROJECT SPECIFIC PIPE LAYOUT WITH MFR. FINAL SYSTEM FIELD CHARGE REQUIRED PER MFR. / M.C..
(6) PROVIDE WITH WALL MOUNTED WIRED CONTROLLER.
(7) INDOOR UNIT POWERED FROM OUTDOOR UNIT.
(8) RUN CONDENSATE PIPING FROM INDOOR UNIT TO EXTERIOR OF BUILDING. TERMINATE DRAIN PIPING AT GRADE WITH CONCRETE SPLASH BLOCKS. CONDENSATE REMOVAL FROM INDOOR UNIT TO OUTDOORS BY GRAVITY.
(9) COVER ALL INTERIOR AND EXTERIOR REFRIGERANT PIPING WITH LINE HIDE SET COVER SYSTEM.
(10) PROVIDE WITH STANDARD FILTRATION.
(11) RATED HEATING CAPACITY SCHEDULED ABOVE IS AT 47°F DB, 43 °F WB OUTDOOR CONDITIONS.
(12) RATED COOLING CAPACITY SCHEDULED ABOVE IS AT 95°F DB, 75°F WB OUTDOOR CONDITIONS.
(13) SYSTEM SHALL HAVE THE ABILITY TO HEAT DOWN TO -22 ° F.
(14) PROVIDE EQUIPMENT WITH BACNET INTEGRATION TO EXISTING BAS.
(15) LOW AMBIANT OPERATION DOWN TO -22°F.

## EXISTING AIR HANDLING UNIT AIR BALANCING SCHEDULE

| NO. | AREA SERVED | DESIGN AIRFLOW (MAX. CFM) | | DESIGN MIN. OUTSIDE AIR | | MANUFACTURER | REMARKS |
|---|---|---|---|---|---|---|---|
| | | ORIGINAL | NEW | ORIGINAL | NEW | | |
| EXRTU-1 | 125 FIREFLY ROOM | 3,000 | 3,000 | 675 | 675 | TRANE | SEE NOTES BELOW |
| EXRTU-2 | 125 FIREFLY ROOM | 2,250 | 2,250 | 795 | 795 | TRANE | SEE NOTES BELOW |
| EXRTU-3 | SEE PLANS | 5,800 | 5,800 | 1,800 | 1,800 | TRANE | SEE NOTES BELOW |
| EXRTU-4 | TOSA ROOM | 9,000 | 9,000 | 2,250 | 2,250 | TRANE | SEE NOTES BELOW |
| | | | | | | | |

NOTES:
(1) SEE SPECIFICATION FOR REQUIEMTNS ASSOCAITED WITH REBALANING OF EXISTING EQUIPMENT.
(2) SEE DRAWINGS FOR INDIVIDUAL ZONE AIRFLOWS AND SPECIFIC ZONE AIR-FLOW MODIFICATIONS.

## GRILLE SCHEDULE

| NO. | TYPE | CFM RANGE | SIZE (IN.) SQ. | SIZE (IN.) ROUND | DIFF. | MAX. NC | OPTIONS | MAT'L | FINISH | FRAME | DAMPER | MOUNTING HEIGHT | MODEL | MANUF. | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SG-1 | DRUM | 1500 | 30/12 | - | 2-WAY | 30 | 1 | ALUM. | W | F | Y | DUCT | AHCD | "PRICE" | SEE NOTES 1 & 2 BELOW |
| | | | | | | | | | | | | | | | - |
| RG-1 | LOUVER FACE | 2250 | 48/24 | - | N/A | 30 | | ALUM. | W | F | - | DUCT | 630 | "PRICE" | SEE NOTE 1 BELOW |
| | | | | | | | | | | | | | | | |

OPTIONS:
1- OPPOSED BLADE DAMPER
2- BUTTERFLY DAMPER
3- FIRE DAMPER
4- COMBINATION DAMPER
5- EQUALIZING GRID
6- RADIAL
7- FILTER
8- WHITE BLANK-OFF PANEL FOR LAY-IN CEILING

ABBREVIATIONS:
A- ANODIZED
ALUM.- ALUMINUM
E- ENAMEL/EPOXY
EG- EXHAUST GRILLE
PERF.- PERFORATED GRILLE
RG- RETURN GRILLE
SG- SUPPLY GRILLE

FRAME:
C- CHANNEL
F- FLANGE
L- LAY-IN
SS- SNAP-IN
T- TEGULAR
SP- SATIN POLISH
S.S.- STAINLESS STEEL
STL- STEEL
TG- TRANSFER GRILLE
W- WHITE

(1) COLOR AS SELECTED BY ARCHITECT.
(2) SPIRAL DUCT MOUTING. PROVIDE SPIRAL FRAME, SPLIT BLADE, AND OPPOSED BLADE VOL. DAMPER.

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
HVAC SCHEDULES

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
M701

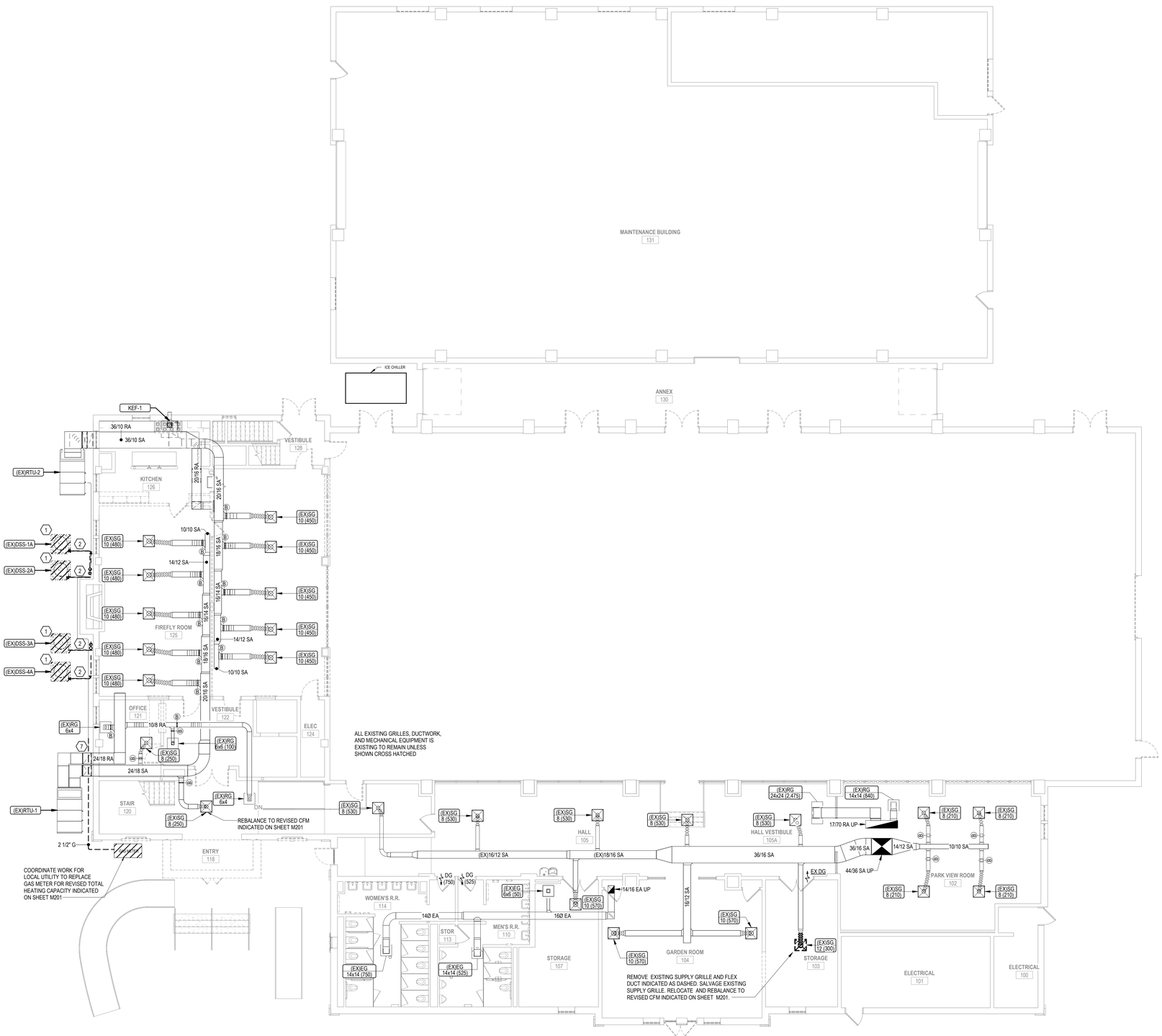
12/19/2023 1:31:21 PM

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

**KEYED NOTES:** ⟵ #

1. REMOVE EXISTING DUCTLESS SPLIT SYSTEM OUTDOOR UNIT INDICATED AS DASHED.
2. REMOVE EXISTING REFRIGERANT PIPING, & DRAIN LINES INDICATED AS DASHED.
3. REMOVE EXISTING DUCTLESS SPLIT SYSTEM INDOOR UNITS AND ASSOCIATED ELECTRICAL CONNECTIONS, CONTROLS, PIPING INDICATED AS DASHED.
4. REMOVE EXISTING RETURN DUCTWORK, GRILLES, FITTINGS INDICATED AS DASHED.
5. REMOVE EXISTING FABRIC SUPPLY DUCT INDICATED AS DASHED.
6. REMOVE DUCTWORK UP THROUGH ROOF INDICATED AS DASHED. PATCH EXISTING OPENING IN ROOF WEATHER TIGHT.
7. REMOVE GAS PIPING UP TO POINT AND REFERENCE SHEET M201 FOR CONNECTION OF NEW TO EXISTING.




1 FIRST FLOOR DUCTWORK DEMOLITION PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
## FIRST FLOOR MECHANICAL DEMOLITION PLAN

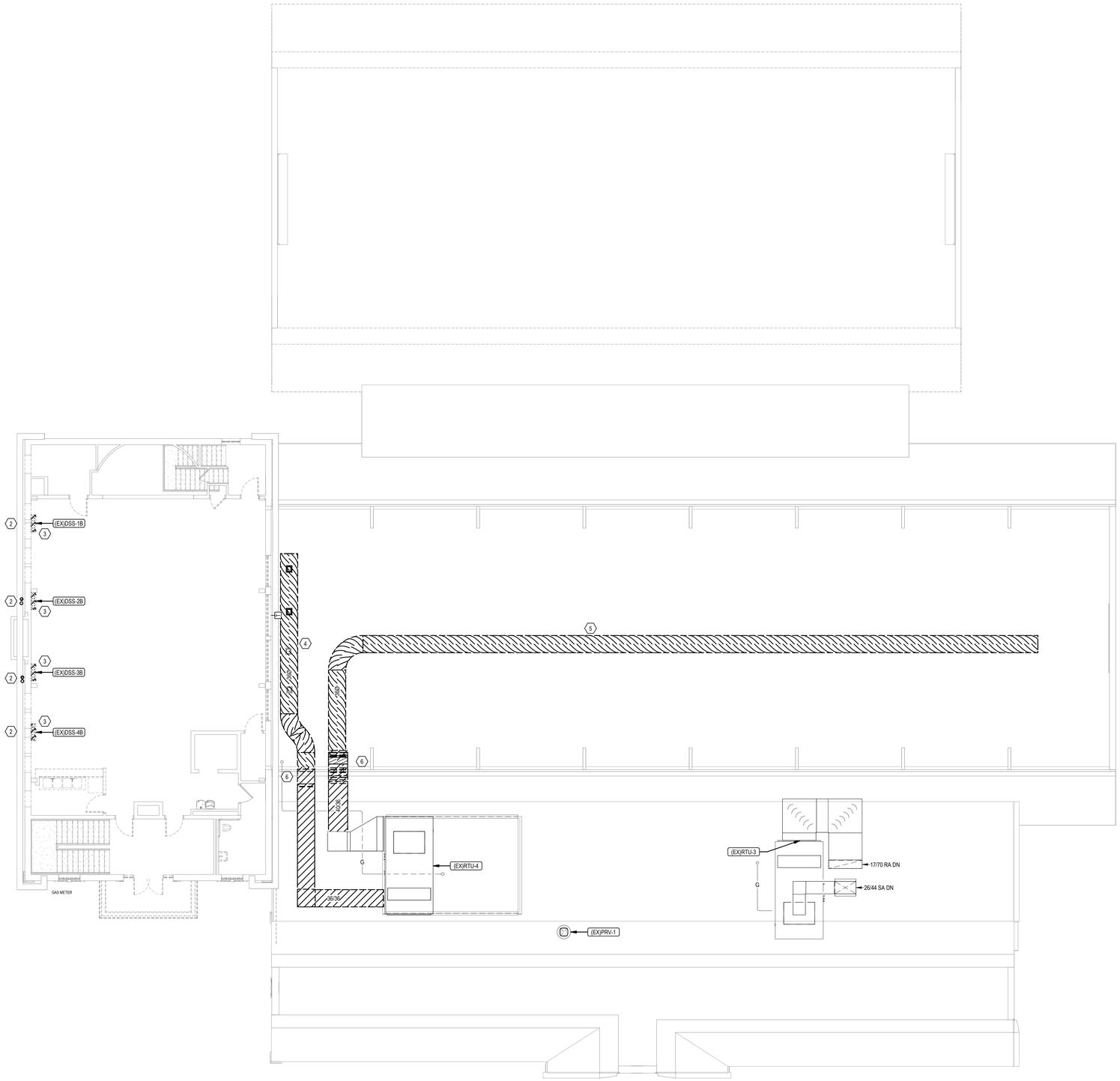
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
MD201

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00




1 SECOND FLOOR DUCTWORK DEMOLITION PLAN
1/8" = 1'-0"

**KEYED NOTES:**

1. REMOVE EXISTING DUCTLESS SPLIT SYSTEM OUTDOOR UNIT INDICATED AS DASHED.
2. REMOVE EXISTING REFRIGERANT PIPING, & DRAIN LINES INDICATED AS DASHED.
3. REMOVE EXISTING DUCTLESS SPLIT SYSTEM INDOOR UNITS AND ASSOCIATED ELECTRICAL CONNECTIONS, CONTROLS, PIPING INDICATED AS DASHED.
4. REMOVE EXISTING RETURN DUCTWORK, GRILLES, FITTINGS INDICATED AS DASHED.
5. REMOVE EXISTING FABRIC SUPPLY DUCT INDICATED AS DASHED.
6. REMOVE DUCTWORK UP THROUGH ROOF INDICATED AS DASHED. PATCH EXISTING OPENING IN ROOF WEATHER TIGHT.
7. REMOVE GAS PIPING UP TO POINT AND REFERENCE SHEET M201 FOR CONNECTION OF NEW TO EXISTING.

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
SECOND FLOOR MECHANICAL DEMOLITION PLAN

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
MD202

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

## ELECTRICAL SYMBOL LEGEND

| SYMBOL | DESCRIPTION |
|---|---|
| GENERAL NOTE FOR LIGHT FIXTURE SYMBOLS. THE MOUNTING TYPE OF LIGHT FIXTURES IS INDICATED IN THE SYMBOLS ON THE DRAWINGS AS FOLLOWS: - NO CENTER DOT INDICATES FIXTURE IS RECESSED. - FILLED CENTER DOT INDICATES FIXTURE IS SURFACE/PENDANT MOUNTED. REFER TO LIGHT FIXTURE SCHEDULE AND LIGHTING PLAN NOTES FOR FURTHER INFORMATION. | |
| | SQUARE/RECTANGULAR LIGHTING FIXTURE |
| | LINEAR LIGHTING FIXTURE |
| | ROUND/RING LIGHTING FIXTURE |
| | WALL WASH LIGHTING FIXTURE |
| | CEILING FAN LIGHTING FIXTURE |
| | WALL-MOUNTED FIXTURES |
| | DIRECTIONAL LIGHT, TRACK, FLOOD |
| | LIGHT TRACK |
| | LOW VOLTAGE LINEAR LIGHT |
| | EMERGENCY LIGHTING UNIT, CEILING-MOUNTED, INTEGRAL BATTERY |
| | EMERGENCY LIGHTING UNIT, CEILING-MOUNTED, REMOTE BATTERY |
| | EMERGENCY BATTERY UNIT, WALL-MOUNTED, INTEGRAL BATTERY |
| | EMERGENCY BATTERY UNIT, WALL-MOUNTED, REMOTE BATTERY |
| | EXIT LIGHT, CEILING-MOUNTED, SHADING AND ARROWS INDICATE FACES AND DIRECTION |
| | EXIT LIGHT, WALL-MOUNTED, SHADING AND ARROWS INDICATE FACES AND DIRECTION |
| | EXIT/EBU COMBO |
| | POLE/AREA LIGHTS |
| | POST-TOP AREA LIGHT |
| | BOLLARD LIGHT |
| | SOLID HATCH INDICATES LIGHT ON AN LIFE SAFETY/EMERGENCY CIRCUIT |
| | DIAGONAL HATCH INDICATES LIGHT ON A CRITICAL/OPTIONAL CIRCUIT |
| | PARTIAL DIAGONAL HATCH INDICATES PART OF LIGHT ON A NORMAL CIRCUITAND PART OF LIGHT ON A CRITICAL/OPTIONAL CIRCUIT |
| | SINGLE POLE SWITCH |
| 3 | 3-WAY SWITCH |
| 4 | 4-WAY SWITCH |
| K | KEYED SWITCH |
| PL | SWITCH W/PILOT |
| DLS | DUAL LEVEL SWITCH |
| | DIMMER SWITCH |
| | SURGICAL LIGHT CONTROL |
| | MOMENTARY CONTACT SWITCH |
| | DIGITAL DISTRIBUTED IN-ROOM SWITCH |
| | DIGITAL DISTRIBUTED IN-ROOM DIMMER SWITCH |
| SO# | REFER TO SEQUENCE OF OPERATIONS IN SPECIFICATIONS 26 09 29 OR SEQUENCE OF OPERATION SCHEDULE |
| OS | OCCUPANCY SENSOR W/ MANUAL SWITCH WALL MOUNT |
| OS | OCCUPANCY SENSOR CEILING MOUNT |
| DL | DAYLIGHT SENSOR WALL MOUNT |
| DL | DAYLIGHT SENSOR CEILING MOUNT |
| T | TIME CLOCK - SEE TIME CLOCK SCHEDULE |
| TC | TIME CONTROL SWITCH |
| P | PHOTO-CELL |
| L | LOW VOLTAGE SWITCH STATION - SEE LOW VOLTAGE SWITCHING STATION SCCHEDULE |
| D | DIGITAL DISTRIBUTED LOW VOLATGE SWITCH STATION SCHEDULE - SEE DISTRIBUTED LOW VOLTAGE SWITCH STATION SCHEDULE |
| W | WIRELESS SWITCH - LINE VOLTAGE SOURCE |
| S | SWITCH STATION - SEE SWITCH STATION SCHEDULE |
| C | CONTACTOR - SEE CONTACTOR SCHEDULE |
| EL | UL924 EMERGENCY LIGHTING CONTROL DEVICE WALL MOUNT |
| EC | UL924 EMERGENCY LIGHTING CONTROL DEVICE CEILING MOUNT |

| SYMBOL | DESCRIPTION |
|---|---|
| | SINGLE RECEPTACLE |
| XX | DUPLEX RECEPTACLE |
| (GFB) | GROUND FAULT BREAKER |
| (GFI) | GROUND FAULT INTERUPTER |
| (IG) | ISOLATED GROUND |
| (TR) | TAMPER RESISTANCE |
| (USB) | W/ USB CHARGING |
| (WP) | WEATHERPROOF |
| XX | DUPLEX RECEPTACLE - MOUNTED AT SPECIAL MOUNTING HEIGHT INDICATED ON DRAWING OR AS INDICATED IN THE ASSOCIATED ARCHITECTURAL ELEVATION. INDICATES MOUNTING HEIGHT WHEN SHOWN |
| | DUPLEX RECEPT. MOUNTED ABOVE COUNTER BACKSPLASH |
| | SPLIT DUPLEX RECEPTACLE |
| | DUPLEX RECEPTACLE ON EMERGENCY CIRCUIT |
| | FLOOR DUPLEX RECEPTACLE |
| | CEILING DUPLEX RECEPTACLE |
| XX | QUADRAPLEX RECEPTACLE |
| (GFB) | GROUND FAULT BREAKER |
| (GFI) | GROUND FAULT INTERUPTER |
| (IG) | ISOLATED GROUND |
| (TR) | TAMPER RESISTANCE |
| (USB) | W/ USB CHARGING |
| (WP) | WEATHERPROOF |
| | QUADRAPLEX RECEPT. MOUNTED ABOVE COUNTER BACKSPLASH |
| XX | QUADRAPLEX RECEPTACLE - MOUNTED AT SPECIAL MOUNTING HEIGHT INDICATED ON DRAWINGS OR AS INDICATED IN THE ASSOCIATED ARCHITECTURAL ELEVATION. INDICATES MOUNTING HEIGHT WHEN SHOWN |
| | FLOOR QUADRAPLEX RECEPTACLE |
| | CEILING QUADRAPLEX RECEPTACLE |
| | QUADRAPLEX RECEPTACLE ON EMERGENCY CIRCUIT |
| | WALL EQUIPMENT CONNECTION |
| | CEILING EQUIPMENT CONNECTION |
| | FLOOR EQUIPMENT CONNECTION |
| | WALL JUNCTION BOX |
| | FLOOR JUNCTION BOX |
| | CEILING JUNCTION BOX |
| FB - FLOOR BOX<br>PT - POKE THROUGH<br>CT - COUNTER TOP<br>TT - TABLE TOP | BOX TYPE |
| FB A 2 2 | FLOOR BOX<br>NUMBER OF DATA OUTLETS<br>NUMBER OF DUPLEX RECEPTACLES |
| PT A 2 2 | POKE THROUGH |
| MO A 5 6 | MULTI ASSEMBLY OUTLETS |
| | CABLE TRAY |
| CT 12" 4" | INDICATES DEPTH (IN INCHES)<br>INDICATES WIDTH (IN INCHES) |
| | UNDERFLOOR DUCT |
| UF 12 3 | INDICATES DEPTH (IN INCHES)<br>INDICATES WIDTH (IN INCHES) |

| SYMBOL | DESCRIPTION |
|---|---|
| | SYSTEMS EQUIPMENT CABINET |
| XX | (AR) AREA OF REFUGE<br>(CA) CABLE TELEVISION<br>(CB) CODE BUTTON<br>(CC) CLOSED CIRCUIT TELEVISION<br>(CLK) CLOCK SYSTEM<br>(DB) DOOR BELL<br>(DV) DIGITAL TELEVISION<br>(EC) EMERGEMCY COMMUNICATION<br>(FA) FIRE ALARM<br>(HP) HOUSE PAGING<br>(IC) INTERCOM<br>(ID) INTRUSION DETECTION<br>(IS) INFANT SECURITY<br>(LM) LOCAL MUSIC<br>(LP) LOCAL PAGING<br>(MA) MASTER ANTENNAE TELEVISION<br>(MN) MASS NOTIFICATION<br>(MS) MUSIC SYSTEM<br>(NC) NURSE CALL<br>(P1) PROCEDURE ROOM -TWO WAY COMMUNICATION<br>(P2) PROCEDURE ROOM -MUSIC SYSTEM<br>(PA) PUBLIC ADDRESS<br>(SA) SECURITY ACCESS<br>(SC) SYSTEM CLOCK<br>(TC) TELECOMMUNICATIONS<br>(TV) TELEVISION<br>(VD) VOICE DATA<br>(WR) WIRED RADIO |
| | (AN) ANNUNCIATOR<br>(BB) BACKBOARD<br>(CP) CONTROL PANEL<br>(ER) EQUIPMENT RACK<br>(TC) TERMINAL CABINET<br>(WF) WALL FIELD<br>(NAC) NOTIFICATION APPLIANCE PANEL |
| XX | ANTENNA |
| | (BO) BY OTHERS<br>(DA) DISTRIBUTED ANTENNA SYSTEM (DAS)<br>(DR) DIRECTIONAL<br>(FR) FIRST RESPONDER RADIO<br>(MD) MULTIDIRECTIONAL<br>(OD) OMNI DIRECTIONAL |
| XX | FIRE ALARM WALL MOUNT |
| XX | FIRE ALARM CEILING MOUNT |
| (CMX) | CONTROL MODULE. X DENOTES SPECIFIC UNIT. SEE CONTROL MODULE SCHEDULE |
| (CO) | CHIME ONLY |
| (COD) | CARBON MONOXIDE DETECTOR |
| (CV1) | CHIME W/ 15 CANDELA STROBE |
| (CV2) | CHIME W/ 30 CANDELA STROBE |
| (CV3) | CHIME W/ 75 CANDELA STROBE |
| (CV4) | CHIME W/ 110 CANDELA STROBE |
| (DH) | DOOR HOLDER |
| (DI) | IONIZATION SMOKE DETECTOR (DUCT) |
| (DP) | PHOTOMETRIC SMOKE DETECTOR (DUCT) |
| (HC) | HEAT/COMBINATION (RATE OF RISE/FIXED) |
| (HF) | HEAT DETECTOR (FIXED) |
| (HO) | HORN ONLY |
| (HR) | HEAT DETECTOR (RATE OF RISE) |
| (HV1) | HORN W/ 15 CANDELA STROBE |
| (HV2) | HORN W/ 30 CANDELA STROBE |
| (HV3) | HORN W/ 75 CANDELA STROBE |
| (HV4) | HORN W/ 110 CANDELA STROBE |
| (MMX) | MONITOR MODULE - SEE MONITOR MODULE SCHEDULE (X DENOTES SPECIFIC UNIT) |
| (PS) | PULL STATION |
| (RE) | RE-ENTRANT HORN |
| (SI) | IONIZATION SMOKE DETECTOR |
| (SO) | SPEAKER ONLY |
| (SP) | PHOTOELECTRIC SMOKE DETECTOR |
| (SPK) | MASS NOTIFICATION SPEAKER |
| (SS) | MASS NOTIFICATION COMBO SPEAKER STROBE |
| (ST) | MASS NOTIFICATION STROBE |
| (SV1) | SPEAKER W/ 15 CANDELA STROBE |
| (SV2) | SPEAKER W/ 30 CANDELA STROBE |
| (SV3) | SPEAKER W/ 75 CANDELA STROBE |
| (SV4) | SPEAKER W/ 110 CANDELA STROBE |
| (VO) | VISUAL UNIT ONLY |
| (VO1) | VISUAL UNIT ONLY, 15 CANDELA STROBE |
| (VO2) | VISUAL UNIT ONLY, 30 CANDELA STROBE |
| (VO3) | VISUAL UNIT ONLY, 75 CANDELA STROBE |
| (VO4) | VISUAL UNIT ONLY, 110 CANDELA STROBE |

| SYMBOL | DESCRIPTION |
|---|---|
| XX | SECURITY, ACCESS CONTROL AND DOOR MONITORING WALL MOUNT |
| XX | SECURITY, ACCESS CONTROL AND DOOR MONITORING CEILING MOUNT |
| (CR) | CARD READER |
| (CXX) | CLOSED CIRCUIT CAMERA - SEE CAMERA SCHEDULES (XX-DENOTES SPECIFIC UNIT) |
| (DB) | DURESS BUTTON |
| (DC) | DOOR CONTACT |
| (EL) | ELECTRONIC LATCH/LOCK |
| (ES) | ELECTRIC STRIKE |
| (GB) | GLASS BREAK DETECTOR |
| (KE) | KEYLESS ENTRY |
| (KP) | KEYPAD - SECURITY SYSTEM |
| (KS) | KEYED SWITCH |
| (LM) | LATCHBOLT MONITOR |
| (MD) | MOTION SENSOR - DUAL TECHNOLOGY |
| (MI) | MOTION SENSOR - INFRARED |
| (ML) | MAGNETIC LOCK |
| (MO) | CLOSED CIRCUIT TELEVISION MONITOR |
| (MU) | MOTION SENSOR - ULTRASONIC |
| (RC) | CLOSED CIRCUIT TELEVISION REMOTE CAMERA CONTROLS |
| (RM) | REQUEST FOR EXIT - MOTION |
| (RP) | REQUEST FOR EXIT PUSH BUTTON |
| (VC) | VIDEO RECORDER |
| XX | DOOR HARDWARE - SEE DETAILS, ARCHITECTURAL PLANS AND SPECIFICATIONS. DEVICES FURNISHED BY OTHERS: ROUGH-IN AND WIRING BY EC. |
| (AA) | AUTODOOR ACTUATOR (PUSH PLATE) |
| (AM) | AUTODOOR ACTUATOR (MOTION SENSOR) |
| (AO) | AUTODOOR OPERATOR |
| (ED) | ELECTRIC EXITING DEVICE |
| (DE) | DELAYED EGRESS MODULE |
| (EL) | ELECTRONIC LATCH/LOCK |
| (ES) | ELECTRIC STRIKE |
| (KS) | KEY SWITCH |
| (ML) | MAGNETIC LOCK |
| (PS) | POWER SUPPLY |
| (PT) | POWER TRANSFER HINGE |
| (RL) | RELAY MODULE |
| (RM) | SEPARATELY MOUNTED REQUEST TO EXIT MOTION SENSOR NOT ASSOCIATED WITH SECURITY SYSTEM |
| XX | PAGING AND SOUND SYSTEMS RECESSED WALL MOUNT |
| XX | PAGING AND SOUND SYSTEMS SURFACE WALL MOUNT |
| XX | PAGING AND SOUND SYSTEMS RECESSED CEILING MOUNT |
| XX | PAGING AND SOUND SYSTEMS SURFACE CEILING MOUNT |
| (DB/SP) | DOORBELL SPEAKER |
| (DP/SP) | DEPARTMENT PAGING SPEAKER |
| (HP/SP) | HOSPITAL PAGING SPEAKER |
| (HW/SP) | HOSPITAL WIDE PAGING & WIRED RADIO SPEAKER |
| (LM/SP) | LOCAL MUSIC SPEAKER |
| (PC/MP) | PROCEDURE ROOM COMMUNICATIONS CEILING MOUNTED MICROPHONE |
| (PC/SP) | PROCEDURE ROOM COMMUNICATIONS SPEAKER |
| (TS/SP) | TELEVISION SYSTEM SPEAKER |
| (WR/SP) | WIRED RADIO SPEAKER |
| (PM/SP) | PROCEDURE ROOM MUSIC SPEAKER |
| (DB/PB) | DOORBELL PUSH BUTTON |
| (DP/MP) | DEPARTMENT PAGING MICROPHONE OUTLET |
| (DP/VC) | DEPARTMENT PAGING VOLUME CONTROL |
| (HP/MP) | HOSPITAL PAGING MICROPHONE OUTLET |
| (HP/VC) | HOSPITAL PAGING VOLUME CONTROL |
| (HW/MP) | HOSPITAL PAGING & WIRED RADIO MICROPHONE OUTLET |
| (HW/VC) | HOSPITAL PAGING & WIRED RADIO VOLUME CONTROL |
| (HW/VS) | HOSPITAL PAGING & WIRED RADIO VOLUME CONTROL WITH STATION SELECTOR |
| (LM/VC) | LOCAL MUSIC SYSTEM VOLUME CONTROL |
| (PC/MP) | PROCEDURE ROOM COMMUNICATIONS MICROPHONE |
| (TS/VC) | TELEVISION SYSTEM VOLUME CONTROL |
| (WR/VC) | WIRED RADIO VOLUME CONTROL |
| (WR/VS) | WIRED RADIO VOLUME CONTROL WITH STATION SELECTOR |

**GRAPHICAL REPRESENTATION OF PHASING, TYPICAL FOR ALL SYMBOLS.**

| EXISTING TO REMAIN | RELOCATED | DEMOLISHED |
|---|---|---|
| M XX-1 | M XX-1 | M XX-1 |

| | |
|---|---|
| | EXISTING TO REMAIN |
| | EXISTING TO BE REMOVED |
| | NEW |
| | ITEM TO BE REMOVED |
| | AREA NOT IN CONTRACT |
| | REVISION NUMBER - SHOWN ON PLANS |
| - ---- | NUMBER OF DETAIL ON SHEET<br>NUMBER OF SHEET WHERE DETAIL APPEARS |
| # | KEYED NOTE |
| Room 6 | ROOM NAME AND NUMBER |
| X ---- | INDICATES DETAIL DESIGNATOR<br>SEE SECTION DETAIL<br>INDICATES SHEET NUMBER |

| SYMBOL | DESCRIPTION |
|---|---|
| G/1 G | GENERATOR |
| M XX-1 | MOTOR<br>IDENTITY (SEE SCHEDULE) |
| | SAFETY DISCONNECT SWITCH (NON-FUSED) |
| | SAFETY DISCONNECT SWITCH (FUSED) |
| | PUSH BUTTON |
| T1 | TRANSFORMER |
| | PANELBOARDS. PANELBOARD DOORS MAY BE SHOWN TO INDICATE OPENING SIDE OF RECESSED PANELBOARDS. SEE PANELBOARD IDENTIFICATION FOR DESIGNATION CODES. |
| | FLOOR CLEARANCE AREA |
| P | POWER POLE (OPEN OFFICE STYLE) |
| G XX | STATIC GROUND RECEPTACLE<br>(GM) GROUND MODULE<br>(PG) POWER GROUND<br>(RI) REMOTE INDICATOR |
| W | WALL PHONE OUTLET |
| | TELECOMMINCATIONS OUTLET MOUNTED ABOVE COUNTER BACKSPLASH |
| XX | TELECOMMINCATIONS OUTLET - MOUNTED AT SPECIAL MOUNTING HEIGHT INDICATED ON DRAWING OR AS INDICATED IN THE ASSOCIATED ARCHITECTURAL ELEVATION. INDICATES MOUNTING HEIGHT WHEN SHOWN |
| #TYPE | TELECOMMINCATIONS OUTLET<br>SEE TELECOMMUNICATIONS HORIZONTAL CABLING SCHEDULE FOR ADDITIONAL INFORMATION.<br>INDICATES JACK/CABLE QUANTITY |
| | FLOOR TELECOMMUNICATIONSOUTLET |
| | CEILING TELECOMMUNICATIONS OUTLET |
| C XX | (A1) 12" ANALOG CLOCK, SINGLE FACE<br>(A2) 9" ANALOG CLOCK, SINGLE FACE<br>(A3) 12" ANALOG CLOCK, DOUBLE FACE<br>(A4) 9" ANALOG CLOCK, DOUBLE FACE<br>(D1) DIGITAL CLOCK, HR:MIN:SEC<br>(D2) DIGITAL CLOCK, HR:MIN<br>(ET) DIGITAL CLOCK, ELAPSED TIMER<br>(EC) ELAPSED TIMER CONTROL |
| PLY | PLYWOOD |
| | DATA RACK |
| | GROUND BAR |

## ELECTRICAL ABBREVIATIONS LIST

| | |
|---|---|
| 1P | 1 POLE (2P, 3P, 4P, ETC.) |
| A | AMPERE |
| AC | ABOVE COUNTER |
| ACLG | ABOVE CEILING |
| ADO | AUTOMATIC DOOR OPENER |
| AF | AMP FRAME |
| AFF | ABOVE FINISHED FLOOR |
| AFG | ABOVE FINISHED GRADE |
| AFI | ARC FAULT CIRCUIT INTERRUPTER |
| AHU | AIR HANDLING UNIT |
| AL | ALUMINUM |
| ALT | ALTERNATE |
| AMP | AMPERE |
| AMPL | AMPLIFIER |
| ANN | ANNUNCIATOR |
| APPROX | APPROXIMATELY |
| ARCH | ARCHITECT, ARCHITECTURAL |
| AS | AMP SWITCH |
| AT | AMP TRIP |
| ATS | AUTOMATIC TRANSFER SWITCH |
| AUTO | AUTOMATIC |
| AUX | AUXILIARY |
| AV | AUDIO VISUAL |
| AWG | AMERICAN WIRE GAUGE |
| BATT | BATTERY |
| BLDG | BUILDING |
| BMS | BUILDING MANAGEMENT SYSTEM |
| C | CONDUIT |
| CAB | CABINET |
| CAT | CATALOG |
| CATV | CABLE TELEVISION |
| CB | CIRCUIT BREAKER |
| CCTV | CLOSED CIRCUIT TELEVISION |
| CKT | CIRCUIT |
| CLG | CEILING |
| COMB | COMBINATION |
| CMPR | COMPRESSOR |
| CONN | CONNECTION |
| CONST | CONSTRUCTION |
| CONT | CONTINUATION OR CONTINUOUS |
| CRT | CATHODE-RAY TUBE |
| CP | CONTROL PANEL |
| CS | COMBINATION STARTER |
| CT | CURRENT TRANSFORMER |
| CTR | CENTER |
| CU | COPPER |
| DC | DATA CENTER |
| DEPT | DEPARTMENT |
| DET | DETAIL |
| DIA | DIAMETER |
| DISC | DISCONNECT |
| DIST | DISTRIBUTION |
| DN | DOWN |
| DS | SAFETY DISCONNECT SWITCH |
| DT | DOUBLE THROW |
| DWG | DRAWING |
| EC | ELECTRICAL CONTRACTOR |
| EF | ENTRANCE FACILITY (LEC) |
| ELEC | ELECTRIC, ELECTRICAL |
| ELEV | ELEVATOR |
| EBU | EMERGENCY BATTERY UNIT |
| EMER | EMERGENCY |
| EMS | ENERGY MANAGEMENT SYSTEM |
| EMT | ELECTRICAL METALLIC TUBING |
| EOL | END OF LINE RESISTOR |
| EP | ELECTRIC PNEUMATIC |
| EQUIP | EQUIPMENT |
| ER | EXISTING RELOCATED |
| ES | EXPOSED STRUCTURE |
| EX | EXISTING TO REMAIN |
| EWC | ELECTRIC WATER COOLER |
| EXH | EXHAUST |
| EXP | EXPLOSION PROOF |
| F | FLUSH |
| FA | FIRE ALARM |
| FABP | FIRE ALARM BOOSTER POWER SUPPLY PANEL |
| FACP | FIRE ALARM CONTROL PANEL |
| FBO | FURNISHED BY OTHER |
| FDR | FEEDER |
| FIXT | FIXTURE |
| FLR | FLOOR |
| FLUOR | FLUORESCENT |
| FS | FLOW SWITCH |
| FU | FUSE |
| FVNR | FULL VOLTAGE NON-REVERSING |
| GA | GAUGE |
| GAL | GALLON |
| GALV | GALVANIZED |
| GC | GENERAL CONTRACTOR |
| GEN | GENERATOR |
| GFB | GROUND FAULT BREAKER |
| GFI | GROUND FAULT CIRCUIT INTERRUPTER |
| GFP | GROUND FAULT PROTECTOR |
| GRD | GROUND |
| GRC | GALVANIZED RIGID STEEL (CONDUIT) |
| GYP | GYPSUM BOARD |
| HOA | HANDS-OFF-AUTOMATIC SWITCH |
| HORIZ | HORIZONTAL |
| HP | HORSEPOWER |
| HPF | HIGH POWER FACTOR |
| HT | HEIGHT |
| HV | HIGH VOLTAGE |
| HVAC | HEATING, VENTILATING AND AIR CONDITIONING |
| IC | INTERRUPTING CAPACITY |
| IG | ISOLATED GROUND |
| IMC | INTERMEDIATE METAL CONDUIT |
| INCAND | INCANDESCENT |
| IR | INFRARED |
| I/W | INTERLOCK WITH |
| J-BOX | JUNCTION BOX |
| KV | KILOVOLT |
| KVA | KILOVOLT-AMPERE |
| KVAR | KILOVOLT-AMPERE REACTIVE |
| KW | KILOWATT |
| KWH | KILOWATT HOUR |
| LEC | LOCAL EXCHANGE CARRIER (E.G AT&T) |
| LG | LAY-IN GRID |
| LOC | LOCATE OR LOCATION |
| LT | LIGHT |
| LTG | LIGHTING |
| LTNG | LIGHTNING |
| LV | LOW VOLTAGE |

| | |
|---|---|
| MAN | MANUAL MOTOR STARTER |
| MAX | MAXIMUM |
| MAG | MAGNETIC STARTER |
| M/C | MOMENTARY CONTACT |
| MC | MECHANICAL CONTRACTOR |
| MCB | MAIN CIRCUIT BREAKER |
| MCC | MOTOR CONTROL CENTER |
| MDC | MAIN DISTRIBUTION CENTER |
| MDP | MAIN DISTRIBUTION PANEL |
| MER | MAIN EQUIPMENT ROOM (AKA "MDF") |
| MFR | MANUFACTURER |
| MFS | MAIN FUSED DISCONNECT SW |
| MH | MANHOLE |
| MIC | MICROPHONE |
| MIN | MINIMUM |
| MISC | MISCELLANEOUS |
| MLO | MAIN LUGS ONLY |
| MOA | MULTIOUTLET ASSEMBLY |
| MPOE | MAIN POINT OF ENTRANCE |
| MSB | MAIN SWITCHBOARD |
| MT | MOUNT |
| MTS | MANUAL TRANSFER SWITCH |
| MTR | MOTOR, MOTORIZED |
| N.C. | NORMALLY CLOSED |
| NEC | NATIONAL ELECTRICAL CODE |
| NEMA | NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION |
| NIC | NOT IN CONTRACT |
| NL | NIGHT LIGHT |
| N.O. | NORMALLY OPEN |
| NPF | NORMAL POWER FACTOR |
| NTS | NOT TO SCALE |
| NU | NEAR UNIT |
| OH | OVERHEAD |
| OL | OVERLOADS |
| OSP | OUTSIDE PLANT |
| OU | OM UNIT |
| PA | PUBLIC ADDRESS |
| PB | PULL BOX OR PUSHBUTTON |
| PC | PLUMBING CONTRACTOR |
| PE SW | PNEUMATIC ELECTRIC |
| PED | PEDESTAL |
| PEN | PENDANT |
| PF | POWER FACTOR |
| PH | PHASE |
| PLBG | PLUMBING |
| PNL | PANEL |
| PP | POWER POLE |
| PR | PAIR |
| PRI | PRIMARY |
| PROJ | PROJECTION |
| PRV | POWER ROOF VENTILATOR |
| PT | POTENTIAL TRANSFORMER |
| PVC | POLYVINYL CHLORIDE (CONDUIT) |
| PWR | POWER |
| QUAN | QUANTITY |
| R | RELAY |
| RECPT | RECEPTACLE |
| REQD | REQUIRED |
| RM | ROOM |
| RTU | ROOF TOP UNIT |
| RVS | REDUCED VOLTAGE STARTING |
| SEC | SECONDARY |
| SHT | SHEET |
| SIM | SIMILAR |
| S/N | SOLID NEUTRAL |
| SPEC | SPECIFICATION |
| SPKR | SPEAKER |
| SPR | SPARE |
| SS | STAINLESS STEEL |
| SSW | SELECTOR SWITCH |
| S/S | STOP/START PUSHBUTTONS |
| STA | STATION |
| STD | STANDARD |
| SURF | SURFACE MOUNTED |
| SW | SWITCH |
| SWBD | SWITCHBOARD |
| SYM | SYMMETRICAL |
| SYS | SYSTEM |
| TBB | TELECOMMUNICATION BONDING BACKBONE |
| TC | TIME CLOCK |
| TCC | TEMPERATURE CONTROL CONTRACTOR |
| TCP | TEMPERATURE CONTROL PANEL |
| TE | TELECOMMUNICATIONS ENCLOSURE |
| TEL | TELEPHONE |
| TELDATA | TELEPHONE/DATA |
| TERM | TERMINAL |
| TGB | TELECOMMUNICATIONS GROUNDING BUSBAR |
| TL | TWIST LOCK |
| TMGB | TELECOMMUNICATIONS MAIN GROUNDING BUSBAR |
| TO | TELECOMMUNICATIONS OUTLET |
| TR | TAMPER RESISTANT |
| TV | TELEVISION |
| TYP | TYPICAL |
| UC | UNDER COUNTER |
| UE | UNDERGROUND ELECTRICAL |
| UG | UNDERGROUND |
| UNIV | UNIVERSAL |
| UT | UNDERGROUND TELEPHONE |
| UTIL | UTILITY |
| USS | UNIT SUBSTATION |
| UV | ULTRAVIOLET |
| V | VOLT |
| VA | VOLT-AMPERES |
| VERT | VERTICAL |
| VFD | VARIABLE FREQUENCY DRIVE |
| VOL | VOLUME |
| W | WATT |
| W/ | WITH |
| W/O | WITHOUT |
| WP | WEATHERPROOF |
| XFMR | TRANSFORMER |
| XFR | TRANSFER |
| ∠ | ANGLE |
| @ | AT |
| ▲ | DELTA |
| ' | FEET |
| " | INCHES |
| # | NUMBER |
| Ø | PHASE |
| C | CENTER LINE |
| P | PLATE |

## ELECTRICAL SHEET INDEX


| | |
|---|---|
| E000 | ELECTRICAL SYMBOLS AND SHEET INDEX |
| ED200 | ELECTRICAL DEMOLITION PLANS |
| E200 | LIGHTING PLANS |
| E210 | POWER PLANS |
| E211 | POWER ROOF PLAN |
| E220 | SYSTEMS PLANS |
| E300 | ENLARGED ELECTRICAL PLANS |
| E400 | ELECTRICAL ONE LINE DIAGRAM |
| E401 | ELECTRICAL ONE LINE DIAGRAM |
| E402 | ELECTRICAL ONE LINE DIAGRAM |
| E520 | ELECTRICAL DETAILS |
| E601 | ELECTRICAL SCHEDULES |
| E602 | ELECTRICAL SCHEDULES |
| E603 | ELECTRICAL SCHEDULES |


### CODES FOR THIS PROJECT

| EDITION | CODE |
|---|---|
| | WISCONSIN 361 - 366 ADMINISTRATION AND ENFORCEMENT<br>THIS INCLUDES THE 2015 EDITION OF:<br>INTERNATIONAL BUILDING CODE<br>INTERNATIONAL ENERGY CODE<br>INTERNATIONAL MECHANICAL CODE<br>INTERNATIONAL FUEL GAS CODE<br>INTERNATIONAL EXISTING BUILDING CODE<br><br>BY ADOPTING THE 2015 INTERNATIONAL BUILDING CODE, THE FOLLOWING NFPA CODES ARE ADOPTED:<br>2013 NFPA 20 STANDARD FOR THE INSTALLATION OF STATIONARY PUMPS FOR FIRE PROTECTION<br>2013 NFPA 72 NATIONAL FIRE ALARM AND SIGNALING CODE<br>2015 NFPA 101 LIFE SAFETY CODE<br>2013 NFPA 110 STANDARD FOR EMERGENCY AND STANDBY SYSTEMS |
| DEC. 2019 | WISCONSIN SPS 316 STATE ELECTRICAL CODE INCLUDES 2017 EDITION OF NFPA 70 |
| | LIGHTING ENERGY CALCULATION METHOD: IECC 2015 |

## ELECTRICAL CIRCUITING

**LIGHTING FIXTURES:**

INDICATES FIXTURE TYPE (TYPICAL)
A 1a,3b — A X-3* (X-*) — EMERGENCY LIGHTING CONTROL DESIGNATOR (TYPICAL)
SECOND DESIGNATOR (TYPICAL)
FIRST DESIGNATOR (TYPICAL)

**LIGHTING CIRCUITING NOTES -**

1. FIRST DESIGNATOR INDICATES THE CIRCUIT AND CONTROL MEANS ASSOCIATED WITH ONE DRIVER CONNECTED TO SOME OF THE LED BOARDS WITHIN FIXTURE. REFER TO LIGHT FIXTURE SCHEDULE FOR MORE INFORMATION.
2. SECOND DESIGNATOR INDICATES THE CIRCUIT AND CONTROL MEANS ASSOCIATED WITH ONE DRIVER CONNECTED TO SOME OF THE LED BOARDS WITHIN FIXTURE. REFER TO LIGHT FIXTURE SCHEDULE FOR MORE INFORMATION.
3. SINGLE DESIGNATOR INDICATES THE CIRCUIT AND MEANS OF CONTROL FOR THE ENTIRE FIXTURE.
4. DESIGNATOR SHOWN WITHIN ( ) INDICATES CIRCUITING AND/OR CONTROL VIA AN EMERGENCY LIGHTING CONTROL UNIT. REFER TO LIGHTING DETAILS FOR WIRING DIAGRAM(S).
5. DIAGONAL HATCH INDICATES FIXTURE SERVED FROM CRITICAL CIRCUIT AND SOLID HATCH INDICATES FIXTURE SERVED FROM EMERGENCY OR LIFE SAFETY CIRCUIT.

**DESIGNATOR DESCRIPTION:**

X-3b
- LOWER CASE LETTERS INDICATE SWITCH DESIGNATION CONTROLLING ASSOCIATED FIXTURE. ABSENCE OF ANY LETTER INDICATES FIXTURES CONTROLLED VIA SWITCH(ES) IN THE ASSOCIATED ROOM. UPPERCASE "U" INDICATES ASSOCIATED FIXTURES ARE UNSWITCHED.
- INDICATES THE CIRCUIT NUMBER SERVING FIXTURES.
- INDICATES BRANCH PANELBOARD SERVING THE FIXTURE. SEE PLAN FOR AREAS SERVED BY PANELBOARD(S).

**ELECTRICAL DEVICES:**

X-3 — DESIGNATOR — XX X-3 — SPECIAL OUTLET DESIGNATOR

**DESIGNATOR DESCRIPTION:**

X-3
- INDICATES THE CIRCUIT NUMBER SERVING DEVICE.
- INDICATES BRANCH PANELBOARD SERVING THE DEVICE. SEE PLAN FOR AREAS SERVED BY PANELBOARD(S).

**NOTE DESCRIPTION:**

| | |
|---|---|
| GENERAL NOTES | - NOTES THAT APPLY TO ALL DRAWINGS WITHIN THE DRAWING SET. |
| SHEET NOTES | - NOTES THAT APPLY TO THE SHEET ON WHICH THEY APPEAR. |
| KEYED NOTES | - NOTES THAT APPLY TO AN AREA, ITEM AND/OR DEVICE ON A FLOOR PLAN OR DETAIL. |
| DETAIL NOTES | - NOTES THAT APPLY TO A SPECIFIC DETAIL. |

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No. 223010.00

CITY OF WAUWATOSA

Sheet Title
ELECTRICAL SYMBOLS AND SHEET INDEX

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E000



12/21/2023 1:52:32 PM

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

## SHEET NOTES

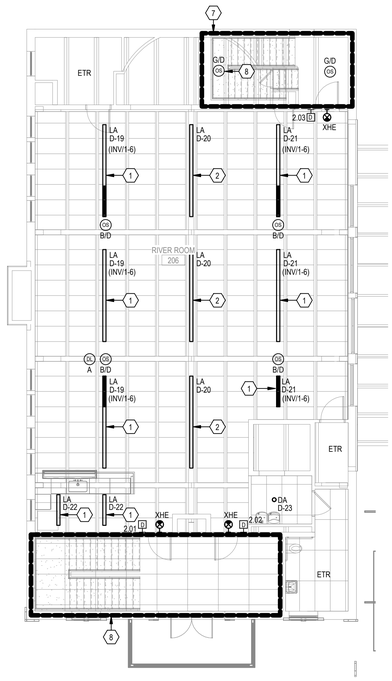
A. "D" AS IN "D-***" INDICATES A CIRCUIT FED FROM A DISTRIBUTED CONTROL SYSTEM, UNLESS OTHERWISE INDICATED. REFER TO DISTRIBUTED ROOM CONTROL SCHEDULE FOR CIRCUIT AND CONTROL INFORMATION.

B. "INV/1" AS IN "INV/1-***" INDICATES FIXTURES CONNECTED TO THE INVERTER.

C. ALL EXIT SIGNS TO BE CONNECTED TO INV/1-6.

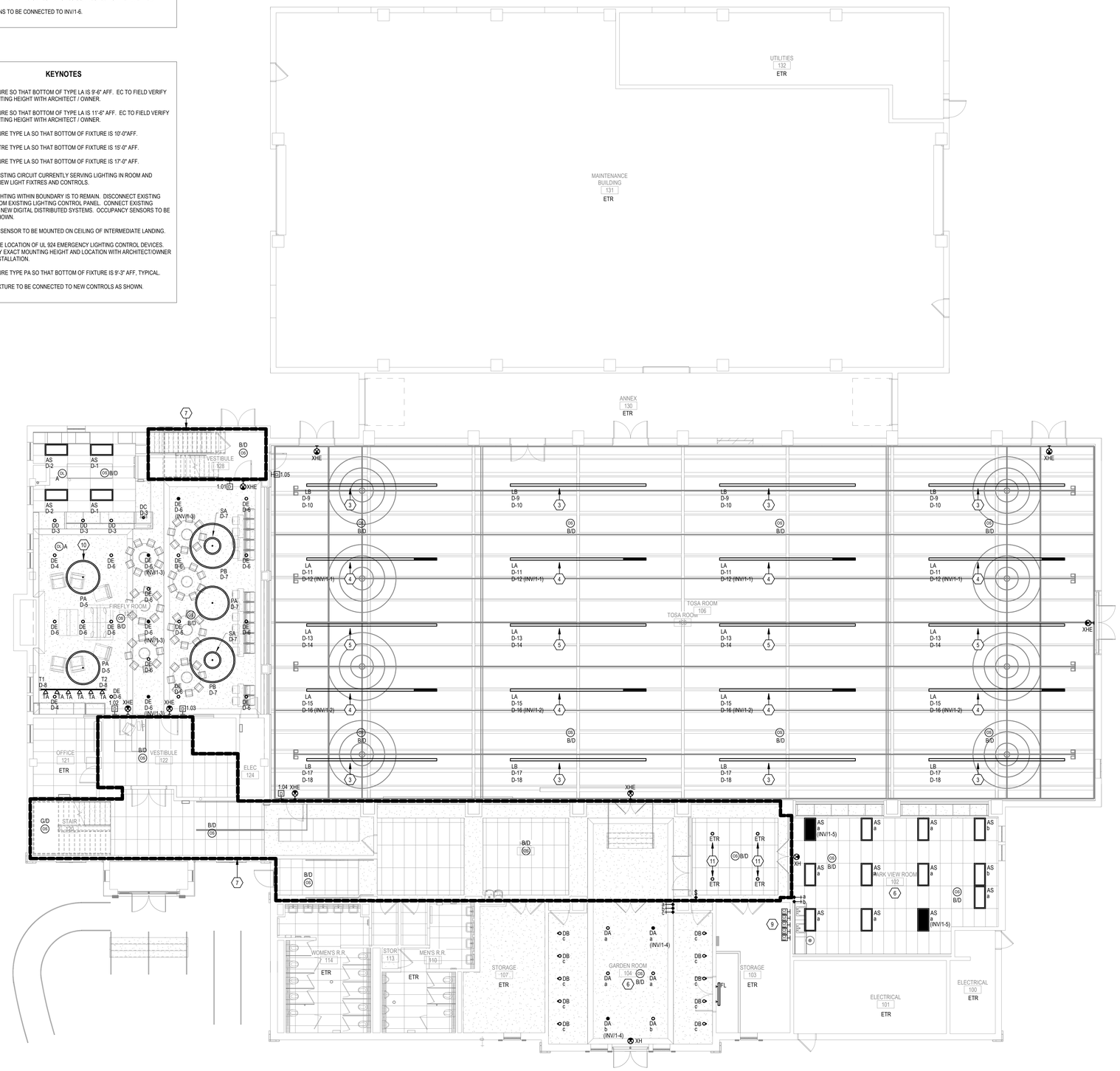
## KEYNOTES

1. MOUNT FIXTURE SO THAT BOTTOM OF TYPE LA IS 9'-6" AFF. EC TO FIELD VERIFY EXACT MOUNTING HEIGHT WITH ARCHITECT / OWNER.
2. MOUNT FIXTURE SO THAT BOTTOM OF TYPE LA IS 11'-6" AFF. EC TO FIELD VERIFY EXACT MOUNTING HEIGHT WITH ARCHITECT / OWNER.
3. MOUNT FIXTURE TYPE LA SO THAT BOTTOM OF FIXTURE IS 10'-0"AFF.
4. MOUNT FIXUTRE TYPE LA SO THAT BOTTOM OF FIXTURE IS 15'-0" AFF.
5. MOUNT FIXTURE TYPE LA SO THAT BOTTOM OF FIXTURE IS 17'-0" AFF.
6. CAPTURE EXISTING CIRCUIT CURRENTLY SERVING LIGHTING IN ROOM AND EXTEND TO NEW LIGHT FIXTRES AND CONTROLS.
7. EXISTING LIGHTING WITHIN BOUNDARY IS TO REMAIN. DISCONNECT EXISTING LIGHTING FROM EXISTING LIGHTING CONTROL PANEL. CONNECT EXISTING LIGHTING TO NEW DIGITAL DISTRIBUTED SYSTEMS. OCCUPANCY SENSORS TO BE ADDED AS SHOWN.
8. OCCUPANCY SENSOR TO BE MOUNTED ON CEILING OF INTERMEDIATE LANDING.
9. APPROXIMATE LOCATION OF UL 924 EMERGENCY LIGHTING CONTROL DEVICES. EC TO VERIFY EXACT MOUNTING HEIGHT AND LOCATION WITH ARCHITECT/OWNER PRIOR TO INSTALLATION.
10. MOUNT FIXTURE TYPE PA SO THAT BOTTOM OF FIXTURE IS 9'-3" AFF, TYPICAL.
11. EXISITING FIXTURE TO BE CONNECTED TO NEW CONTROLS AS SHOWN.




4 SECOND FLOOR LIGHTING PLAN
1/8" = 1'-0"

NORTH




1 FIRST FLOOR LIGHTING PLAN
1/8" = 1'-0"

NORTH

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
LIGHTING PLANS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E200

12/21/2023 1:52:33 PM

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00

## SHEET NOTES

A. REFER TO ARCHITECTURAL PLANS, ELEVATIONS, AND DETAILS FOR LOCATIONS AND MOUNTING HEIGHTS OF ALL ELECTRICAL DEVICES PRIOR TO COMMENCING INSTALLATION.

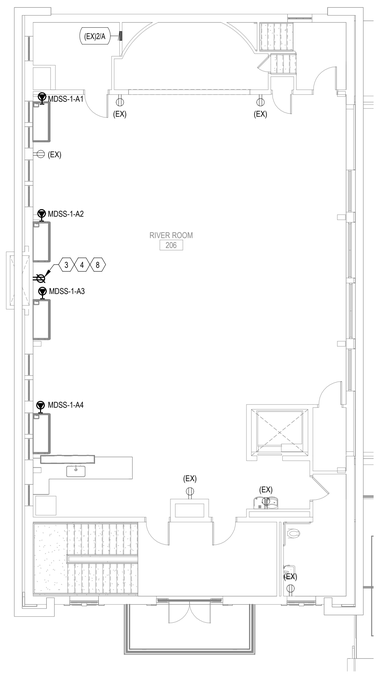
B. CIRCUIT NUMBERS INDICATED DO NOT REFLECT THE ACTUAL POSITION OF THE CIRCUIT BREAKERS IN THE PANEL; RATHER, THE NUMBERS INDICATE WHICH DEVICES ARE CONNECTED TO A COMMON CIRCUIT.

C. EXISTING TO REMAIN, "EX", ON THIS PLAN REFERS TO THE STATUS OF BASIC ELECTRICAL DEVICES. THERE MAY BE SOME WORK REQUIRED IN THESE SPACES INVOLVING BACK-FEEDING EXISTING CIRCUITS OR OTHER MODIFICATIONS. SEE ALL DOCUMENTS THAT MAKE UP THIS CONTRACT FOR THE TOTAL EXTENT OF WORK REQUIRED IN ALL SPACES.

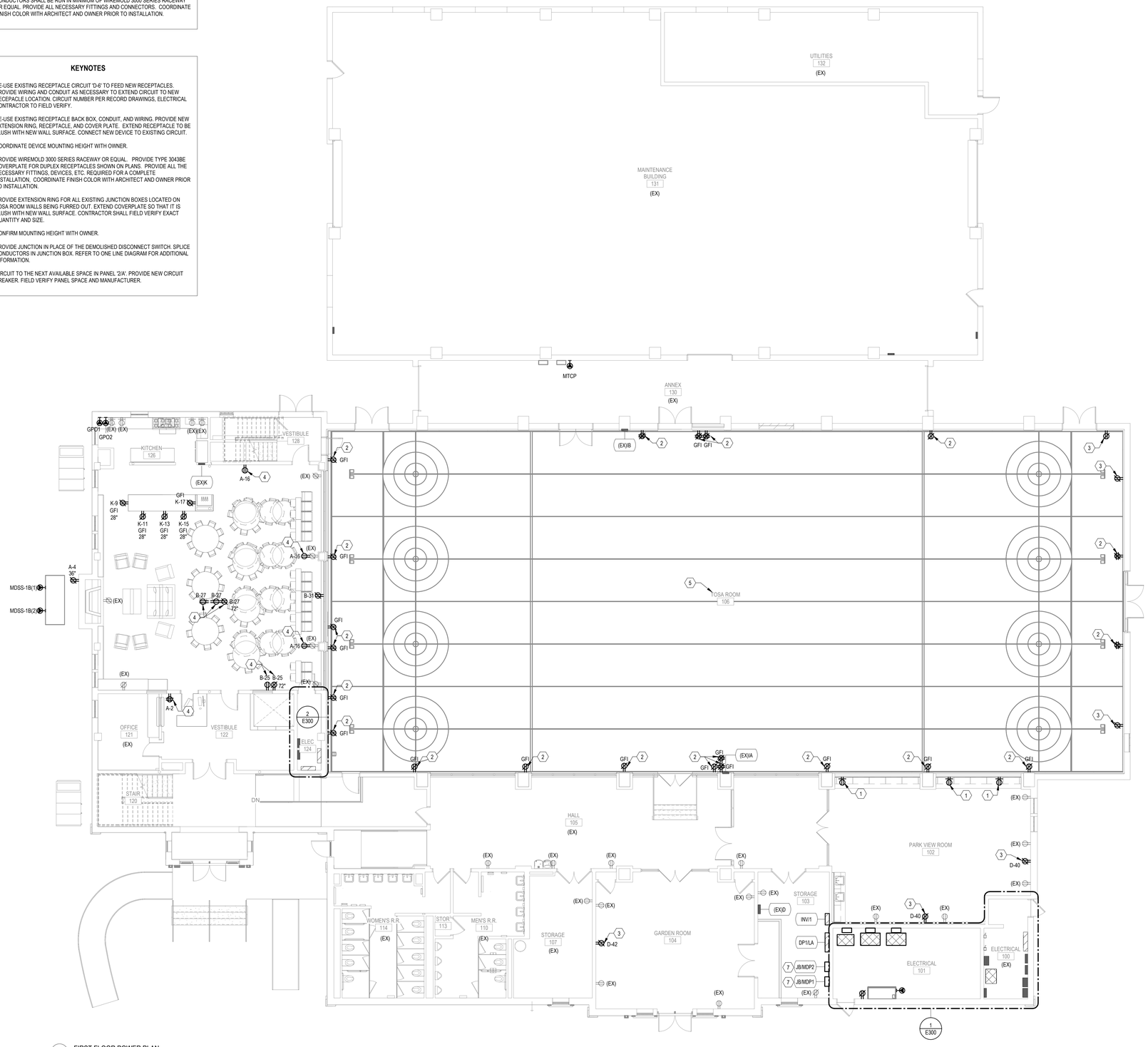
D. WHERE EXISTING WALLS AND CEILINGS ARE NOT BEING REMOVED, ELECTRICAL CONDUCTORS SHALL BE RUN IN MINIMUM OF WIREMOLD 3000 SERIES RACEWAY OR EQUAL. PROVIDE ALL NECESSARY FITTINGS AND CONNECTORS. COORDINATE FINISH COLOR WITH ARCHITECT AND OWNER PRIOR TO INSTALLATION.

## KEYNOTES

1. RE-USE EXISTING RECEPTACLE CIRCUIT "D-6" TO FEED NEW RECEPTACLES. PROVIDE WIRING AND CONDUIT AS NECESSARY TO EXTEND CIRCUIT TO NEW RECEPACLE LOCATION. CIRCUIT NUMBER PER RECORD DRAWINGS, ELECTRICAL CONTRACTOR TO FIELD VERIFY.
2. RE-USE EXISTING RECEPTACLE BACK BOX, CONDUIT, AND WIRING. PROVIDE NEW EXTENSION RING, RECEPTACLE, AND COVER PLATE. EXTEND RECEPTACLE TO BE FLUSH WITH NEW WALL SURFACE. CONNECT NEW DEVICE TO EXISTING CIRCUIT.
3. COORDINATE DEVICE MOUNTING HEIGHT WITH OWNER.
4. PROVIDE WIREMOLD 3000 SERIES RACEWAY OR EQUAL. PROVIDE TYPE 3043BE COVERPLATE FOR DUPLEX RECEPTACLES SHOWN ON PLANS. PROVIDE ALL THE NECESSARY FITTINGS, DEVICES, ETC. REQUIRED FOR A COMPLETE INSTALLATION. COORDINATE FINISH COLOR WITH ARCHITECT AND OWNER PRIOR TO INSTALLATION.
5. PROVIDE EXTENSION RING FOR ALL EXISTING JUNCTION BOXES LOCATED ON TOSA ROOM WALLS BEING FURRED OUT. EXTEND COVERPLATE SO THAT IT IS FLUSH WITH NEW WALL SURFACE. CONTRACTOR SHALL FIELD VERIFY EXACT QUANTITY AND SIZE.
6. CONFIRM MOUNTING HEIGHT WITH OWNER.
7. PROVIDE JUNCTION IN PLACE OF THE DEMOLISHED DISCONNECT SWITCH. SPLICE CONDUCTORS IN JUNCTION BOX. REFER TO ONE LINE DIAGRAM FOR ADDITIONAL INFORMATION.
8. CIRCUIT TO THE NEXT AVAILABLE SPACE IN PANEL "2/A". PROVIDE NEW CIRCUIT BREAKER. FIELD VERIFY PANEL SPACE AND MANUFACTURER.




2 SECOND FLOOR POWER PLAN
1/8" = 1'-0"




1 FIRST FLOOR POWER PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
POWER PLANS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

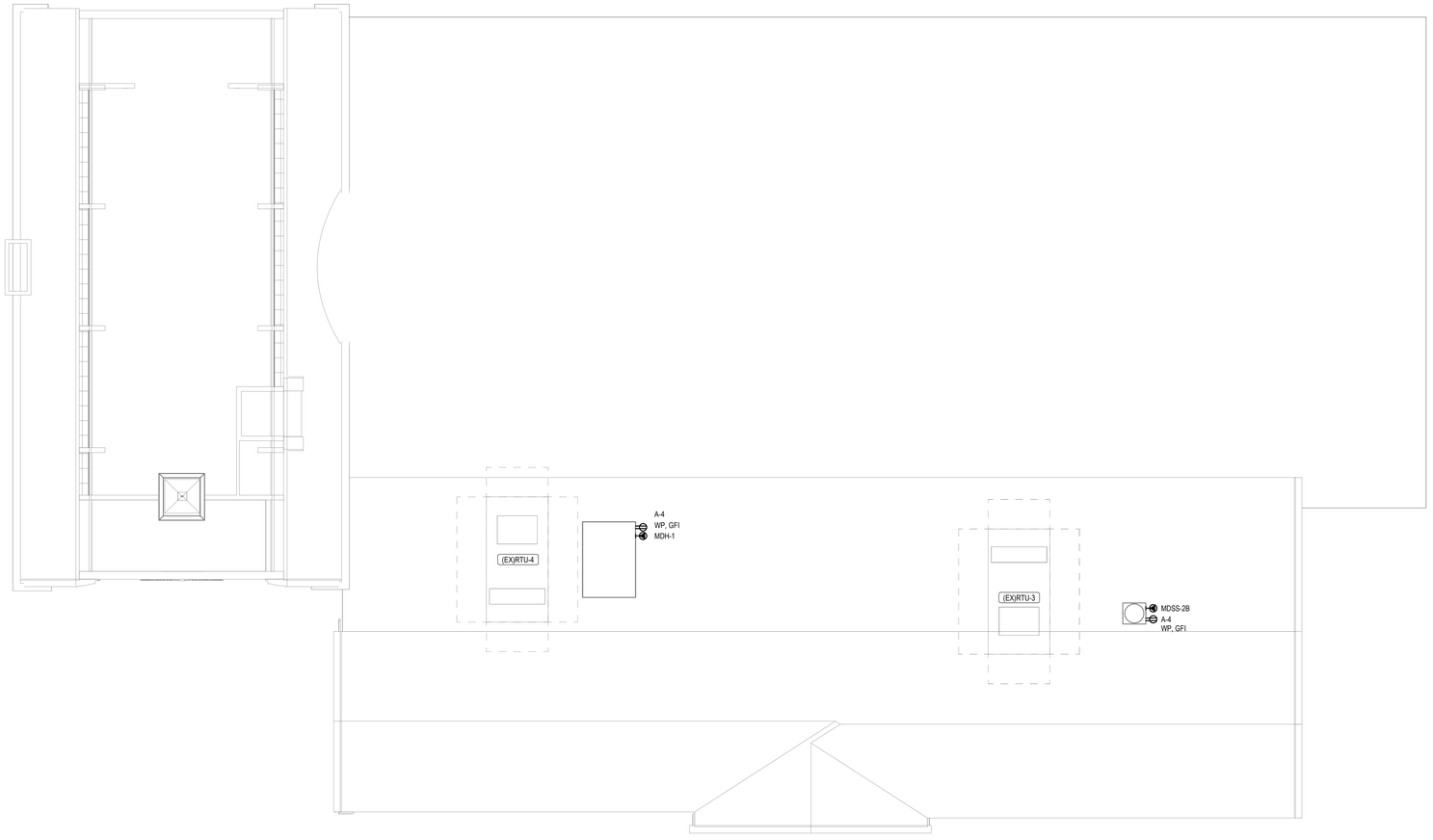
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E210

12/21/2023 1:52:37 PM

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00




1 ROOF POWER PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
POWER ROOF PLAN

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E211

12/21/2023 1:52:38 PM

Kahler Slater

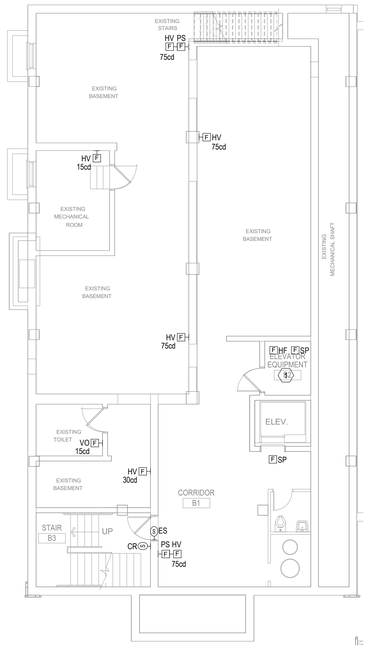
RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Bicount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

### SHEET NOTES

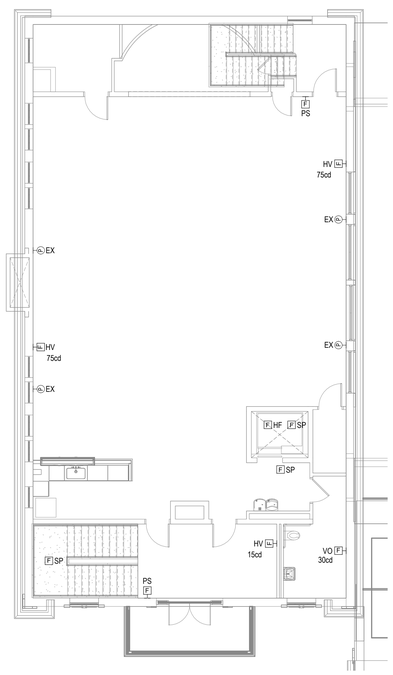
A. PROVIDE NEW HVAC DUCT MOUNTED SMOKE DETECTORS AND HVAC INTERFACES FOR UNIT SHUT DOWN. COORDINATE EXACT REQUIREMENTS WITH MECHANICAL CONTRACTOR. FOR BIDDING PURPOSES ASSUME SMOKE DETECTION IS REQUIRED AT BOTH THE SUPPLY AND RETURN OF ALL HVAC AIR HANDLING UNITS. ASSUME CONTROL MODULE INTERFACES ARE REQUIRED AT ALL EXISTING HVAC VFD'S.

### KEYNOTES

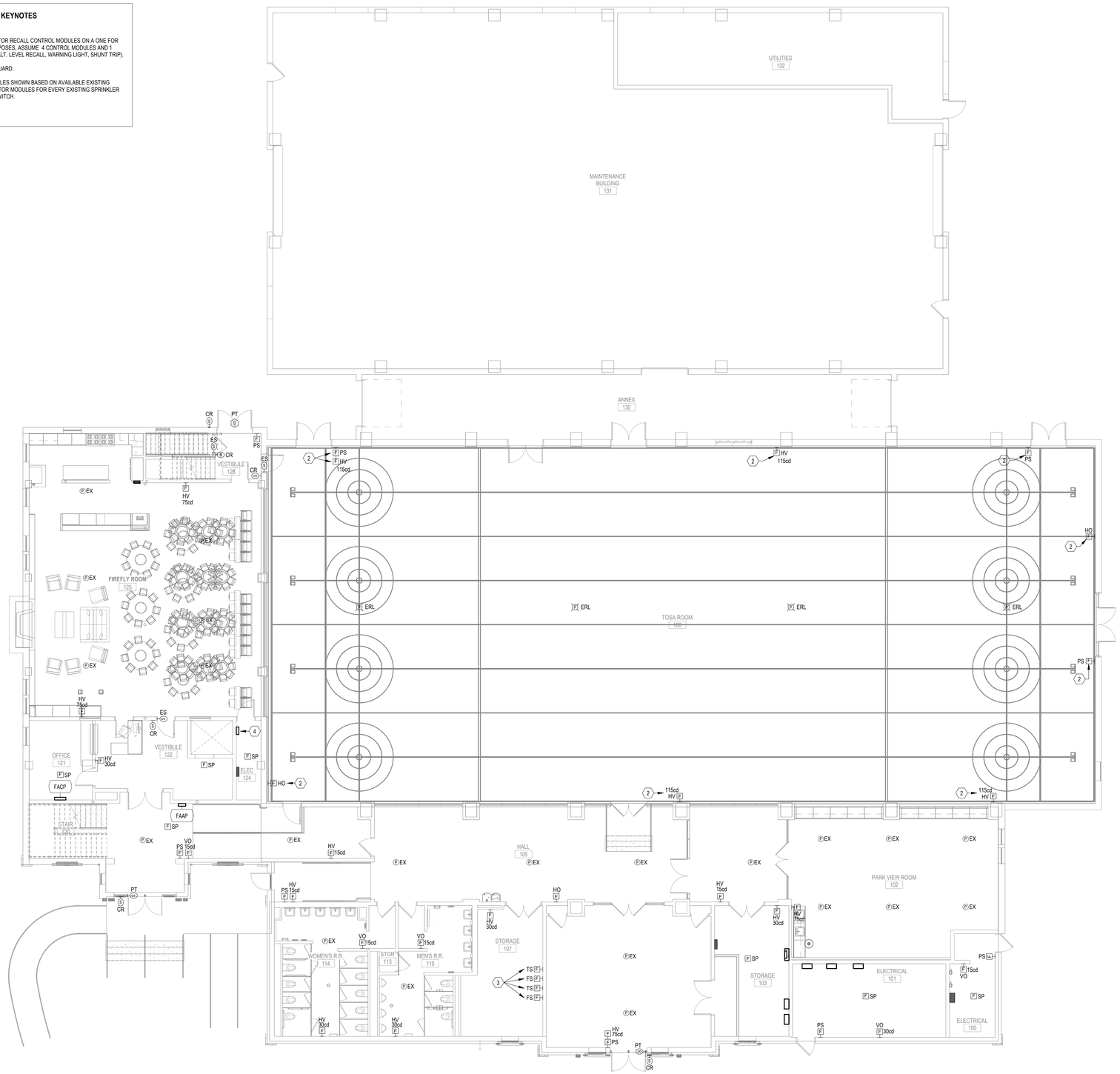
1. REPLACE ALL EXISTING ELEVATOR RECALL CONTROL MODULES ON A ONE FOR ONE BASIS. FOR BIDDING PURPOSES, ASSUME 4 CONTROL MODULES AND 1 MONITOR MODULE. (PRIMARY/ALT. LEVEL RECALL, WARNING LIGHT, SHUNT TRIP).
2. PROVIDE DEVICE WITH WIRE GUARD.
3. MONITOR AND CONTROL MODULES SHOWN BASED ON AVAILABLE EXISTING INFORMATION. PROVIDE MONITOR MODULES FOR EVERY EXISTING SPRINKLER SYSTEM TAMPER AND FLOW SWITCH.
4. NEW SECURITY CABINET.




3 BASEMENT SYSTEMS PLAN
1/8" = 1'-0"



2 SECOND FLOOR SYSTEMS PLAN
1/8" = 1'-0"




1 FIRST FLOOR SYSTEMS PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
SYSTEMS PLANS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

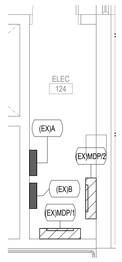
Sheet No.
E220

Kahler Slater

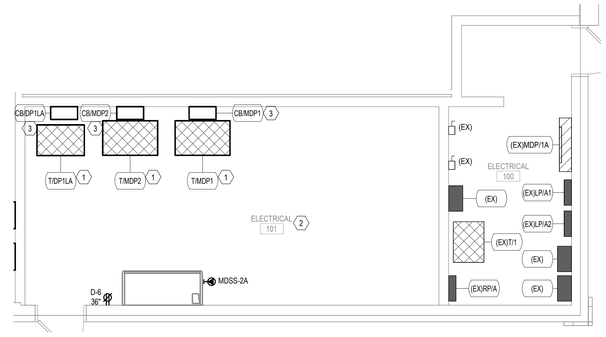
RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00

**KEYNOTES**

1. MOUNT TRANSFORMER TO STRUCTURAL SUPPORT PLATFORM LOCATED AT 7' 6" AFF.
2. PATCH AND SEAL ALL OPENINGS IN THE FLOOR, WALLS AND CEILING IN THIS ROOM.
3. ENCLOSED CIRCUIT BREAKER SHALL BE MOUNTED DIRECTLY BELOW TRANSFORMER.




2 ENLARGED ELEC 124
1/4" = 1'-0"




1 ENLARGED ELECTRICAL ROOM POWER PLAN
1/4" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
ENLARGED ELECTRICAL PLANS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E300

12/21/2023 1:52:43 PM

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

## ONE-LINE SYMBOLS

MEDIUM VOLTAGE FUSE
MEDIUM VOLTAGE FUSIBLE SWITCH
MEDIUM VOLTAGE SWITCH
MEDIUM VOLTAGE FUSED CUTOUT
MEDIUM VOLTAGE CABLE TERMINATION

LOW VOLTAGE FUSE
LOW VOLTAGE FUSED DISCONNECT SWITCH
LOW VOLTAGE DISCONNECT SWITCH
LOW VOLTAGE CIRCUIT BREAKER
LOW VOLTAGE DRAWOUT CIRCUIT BREAKER
LOW VOLTAGE DRAWOUT POWER CIRCUIT BREAKER

XX — DENOTES THE FOLLOWING:
(XX) DEVICE DESIGNATION TYPE - SEE SPECIFICATION

DENOTES THE FOLLOWING:
(AM) AMMETER
(AS) AMMETER SWITCH
(DM) DIGITAL METER
(M) KWHR METER
(VM) VOLTMETER
(VS) VOLTMETER SWITCH

POTENTIAL TRANSFORMER
CURRENT TRANSFORMER
SURGE SUPPRESSION
XX — DENOTES
LA = LIGHTNING ARRESTORS
SPD = SURGE PROTECTIVE DEVICE
CAPACITOR
GROUND
EQUIPMENT CONNECTION - SEE EQUIPMENT SCHEDULE
JUNCTION BOX
G — ENGINE GENERATOR

K# — KEY INTERLOCKING - KEY # KEY NORMALLY INSERTED -SEE SCHEDULE & DETAILS
K# — KEY INTERLOCKING - KEY # KEY NORMALLY REMOVED -SEE SCHEDULE & DETAILS
X / X — PANELBOARD
TRANSFORMER
MANUAL OR AUTOMATIC TRANSFER SWITCH
NO NO NC — BYPASS ISOLATION TRANSFER SWITCH

XX / XX — ENCLOSURE
DENOTES THE FOLLOWING:
(XX) DEVICE DESIGNNATION

DENOTES THE FOLLOWING:
(ATS) AUTOMATIC TRANSFER SWITCH
(BW) BUS WAY
(CAP) CAPACITOR
(CB) CIRCUIT BREAKER
(CON) CONTACTOR
(DS) DISCONNECT SWITCH
(EDS) ELEVATOR DISCONNECT SWITCH
(EDP) ELEVATOR DISTRIBUTION PANEL
(F) FUSE
(FS) FUSIBLE SWITCH
(JB) JUNCTION BOX
(MTS) MANUAL TRANSFER SWITCH
(MVC) MEDIUM VOLTAGE FUSED CUTOUT
(MVF) MEDIUM VOLTAGE FUSE
(MVFS) MEDIUM VOLTAGE FUSIBLE SWITCH
(MVS) MEDIUM VOLTAGE SWITCH
(MVT) MEDIUM VOLTAGE CABLE TERMINATION
(PLC) POWER LINE CONDITIONER
(T) TRANSFORMER
(SS) SURGE SUPPRESSION
(UPS) UNINTERRUPTIBLE POWER SUPPLY
(WW) WIREWAY

X — FEEDER CONTINUATION CONNECTION #
EXX — FEEDER CONTINUED ON SHEET INDICATED
XXX/XX — DEVICE UPSTREAM OR DOWNSTREAM

OVERLOAD
NORMALLY CLOSED CONTACTOR
NORMALLY OPEN CONTACTOR
FLOAT SWITCH
LIGHT FIXTURE
1 2 — CONTROL SWITCH

## TRANSFORMER INFORMATION

T — TRANSFORMER ID
XX | XXX kVA — kVA
P: XXX — PRIMARY VOLTAGE
S: XXX — SECONDARY VOLTAGE
XXX | XXX — TEMPERATURE RISE
XXX — MOUNTING TYPE
X / X / X — OPTIONS
1 - NON VENTILATED ENCLOSURE
2 - INTEGRAL STRIP HEATER
3 - WEATHER SHIELD
4 - NEMA 3R
5 - STAINLESS STEEL

TYPE
DT - DRY TYPE
LF - LIQUID FILLED
DP - DRY TYPE PAD MOUNT
LP - LIQUID FILLED PAD MOUNT
CR - CAST RESIN
EC - ENCAPSULATED CORE

RATING
EE - ENERGY EFFICIENT
GP - GENERAL PURPOSE
K-# - K-RATED

## SURGE PROTECTIVE DEVICE

SPD — SPD ID
XXX — VOLTAGE
X / X / X / X

TYPE
SE - 125 kA - SERVICE ENTRANCE
BP - 80 kA - BRANCH PANEL

OPTIONS
1 - UNIT STATUS INDICATORS
2 - AUDIBLE ALARM
3 - TRANSIENT COUNTER
4 - REMOTE MONITOR PANEL
5 - SERVICE DISCONNECT SWITCH
6 - SUMMARY ALARM RELAY CONTACTS
7 - HIGH PERFORMANCE INTERCONNECT CABLE
8 - MASTERMIND MONITORING

## CIRCUIT BREAKER INFORMATION

"XXX" - DENOTES AMP RATING
XXXAF — "AF" - DENOTES AMP FRAME
XXXAS — "AS" - DENOTES AMP SENSOR
XXXAT — "AT" - DENOTES AMP TRIP
3P
XX | XXX
XX | XXX
XX | XXX

### CIRCUIT BREAKER ACCESSORIES
ALS - ALARM SWITCH
AXS - AUXILIARY SWITCH
EOP - ELECTRIC OPERATOR
ST - SHUNT TRIP
UVT - UNDER VOLTAGE TRIP

### CIRCUIT BREAKER OPTIONS
AF - ARC FAULT CIRCUIT INTERRUPTER (RESIDENTIAL ONLY)
AR - ARC FLASH REDUCTION
CL - CURRENT LIMITING
FR - FULLY RATED (100%)
GE - GROUND FAULT PROTECTION - EQUIPMENT
GP - GROUND FAULT PROTECTION - PERSONNEL
GS - GROUND FAULT SENSING / ALARM
HC - HEATING, COOLING, AIR CONDITIONING, REFRIGERATION - HCAR
HM - HIGH MAGNETIC - HID, MOTORS
MD - MODIFIED DIFFERENTIAL GROUND FAULT
MP - MOTOR CIRCUIT PROTECTOR
MS - MOLDED CASE SWITCH
L1 - LONG TIME / INSTANTANEOUS - LI
L2 - LONG TIME / SHORT TIME / INSTANTANEOUS - LSI
L3 - LONG TIME / SHORT TIME / INSTANTANEOUS / GROUND FAULT TRIP - LSIG
L4 - LONG TIME / SHORT TIME / INSTANTANEOUS / GROUND FAULT SENSING - LSIA
SC - SYSTEM COMMUNICATION
SD - SYSTEM DIAGNOSTICS
SM - SYSTEM MONITORING
ZS - ZONE SELECTIVE INTERLOCKING

### CIRCUIT BREAKER TYPE
MC - MOLDED CASE CIRCUIT BREAKER
IC - INSULATED CASE CIRCUIT BREAKER
PC - LOW VOLTAGE POWER CIRCUIT BREAKER
SS - SOLID STATE MOLDED CASE CIRCUIT BREAKER

## GENERAL NOTES -

1. ALL ITEMS INDICATED BY A DARK SOLID LINE AS SHOWN BELOW ARE NEW.
2. ALL ITEMS INDICATED BY A LIGHT DASHED LINE AS SHOWN BELOW ARE EXISTING TO REMAIN.
3. ALL ITEMS INDICATED BY A DARK DASH-DOT-DASH LINE AS SHOWN BELOW ARE EXISTING TO BE REMOVED.
4. ALL ITEMS INDICATED BY A LIGHT DASH-DOT-DASH LINE AS SHOWN BELOW ARE TYPICAL EQUIPMENT DIVISIONS.
5. ALL ITEMS INDICATED BY A LIGHT SOLID LINE AS SHOWN BELOW ARE FUTURE.
6. ALL DOWNTIME SHALL BE SCHEDULED WITH THE OWNER AND SHALL BE KEPT TO AN ABSOLUTE MINIMUM.
7. THE PANELS AND SWITCHBOARDS INDICATED ON THE ONE LINE DIAGRAM SHALL BE PROTECTED FROM AVAILABLE FAULT CURRENT SHOWN BY EITHER OF THE FOLLOWING METHODS:
   - PROVIDE BREAKERS WITH A MINIMUM AIC RATING GREATER THAN INDICATED
   - THE SERIES RATING METHOD IS NOT ACCEPTABLE

## LOW VOLTAGE DISCONNECT SWITCH INFORMATION

XXXAS
3P
XXXAF
DS | XXX
XXX | XXX
XXX | XXX

"XXX" - DENOTES AMP RATING
XXXAS — "AS" - DENOTES AMP SWITCH
XXXAF — "AF" - DENOTES AMP FUSE
FS | XXX
XXX | XXX
XXX | XXX

### DISCONNECT SWITCH ACCESSORIES
AXS - AUXILIARY SWITCH
DL - DOUBLE LUGS
PL - PILOT LIGHT
VW - VIEWING WINDOW

### DISCONNECT SWITCH TYPE
DS - UNFUSED DISCONNECT SWITCH
EDS - ELEVATOR DISCONNECT SWITCH
FS - FUSED DISCONNECT SWITCH

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
ELECTRICAL ONE LINE DIAGRAM

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E400

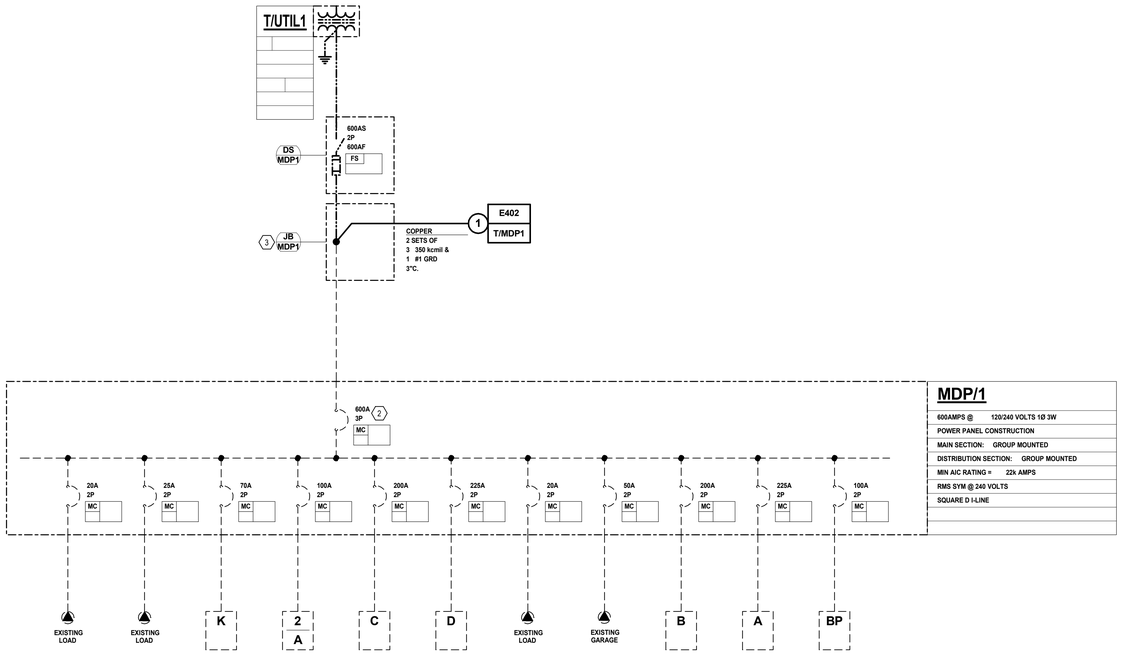
12/21/2023 1:52:44 PM

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00

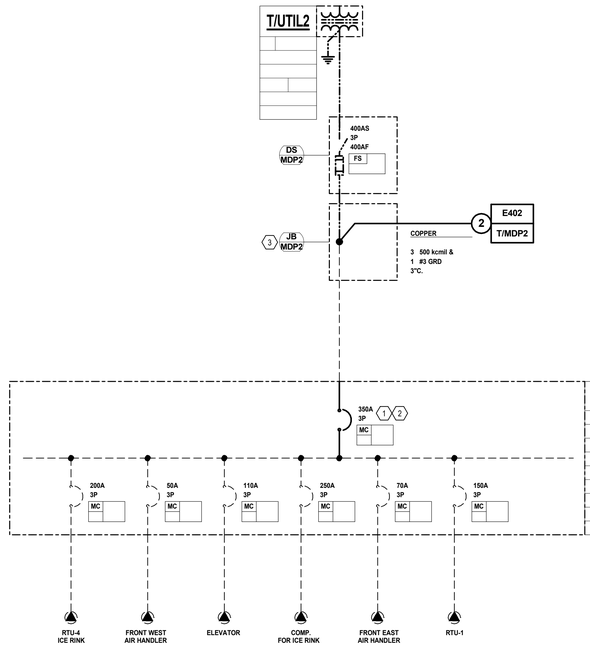
**KEYED NOTES**

1. PROVIDE NEW SQUARE D CIRCUIT BREAKER AS SHOWN.
2. PROVIDE LABEL AT BREAKER THAT READS "DISCONNECT LOCATED IN ELECTRICAL ROOM 101".
3. PROVIDE NEW JUNCTION BOX IN PLACE OF DISCONNECT SWITCH.




**MDP/1**

| | |
|---|---|
| 600AMPS @ | 120/240 VOLTS 1Ø 3W |
| POWER PANEL CONSTRUCTION | |
| MAIN SECTION: | GROUP MOUNTED |
| DISTRIBUTION SECTION: | GROUP MOUNTED |
| MIN A/C RATING = | 22k AMPS |
| RMS SYM @ 240 VOLTS | |
| SQUARE D I-LINE | |




**MDP/2**

| | |
|---|---|
| 400AMPS @ | 240 VOLTS 3Ø 3W GROUNDED B |
| POWER PANEL CONSTRUCTION | |
| MAIN SECTION: | GROUP MOUNTED |
| DISTRIBUTION SECTION: | GROUP MOUNTED |
| MIN A/C RATING = | 14k AMPS |
| RMS SYM @ 240 VOLTS | |
| SQUARE D I-LINE | |

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
ELECTRICAL ONE LINE DIAGRAM

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

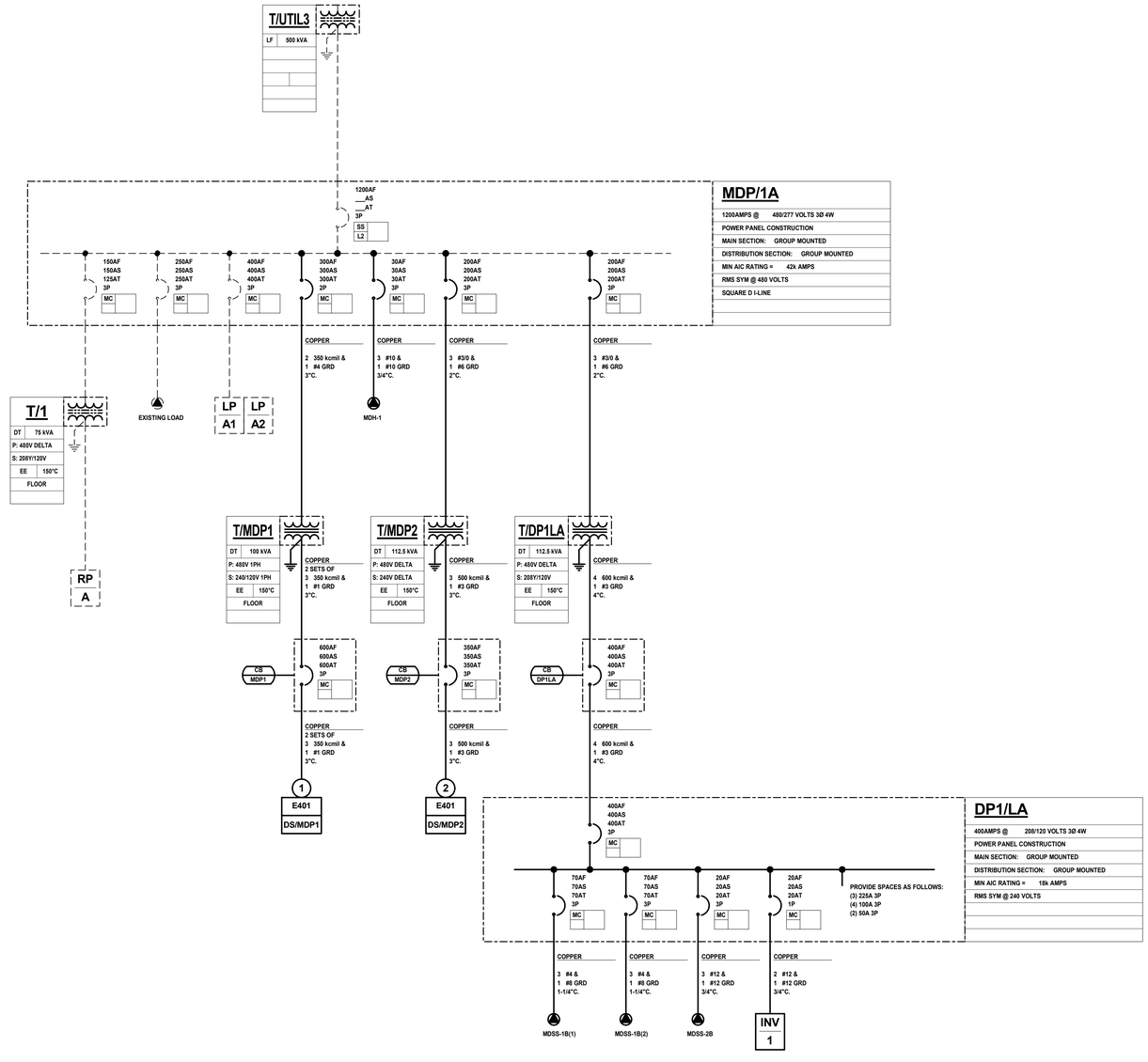
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E401

12/21/2023 1:52:44 PM

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | rd@ringdu.com
RD Project Number: 223003.00




Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
ELECTRICAL ONE LINE DIAGRAM

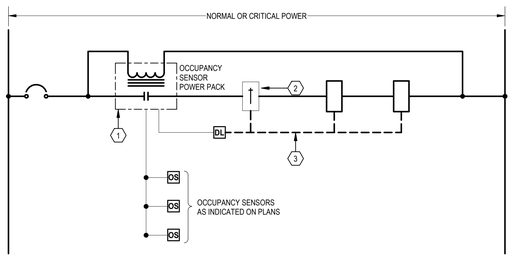
Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E402

Kahler Slater

RING & DUCHATEAU
CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00



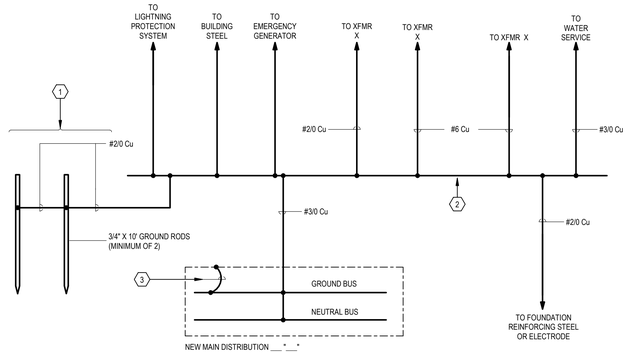

**DETAIL NOTES -**

1. DETAIL INDICATES A TYPICAL OCCUPANCY SENSOR WIRING DIAGRAM. SEE FLOOR PLANS FOR THE REQUIRED LIGHTING CONTROL CONFIGURATION. PROVIDE THE NECESSARY CONTROL COMPONENTS AND WIRING FOR A COMPLETE SYSTEM.
2. SEE FLOOR PLANS FOR QUANTITIES, TYPES AND LOCATIONS OF OCCUPANCY SENSORS.
3. ALL FIXTURES LOCATED IN THE ROOM MONITORED BY OCCUPANCY SENSORS SHALL BE CONTROLLED BY THESE SENSORS.

**KEYED NOTES -**

1. MOUNT IN JUNCTION BOX ABOVE ACCESSIBLE CEILING.
2. 0-10V, CLASS 2 WIRES.
3. OPTIONAL WALLBOX DIMMER.

3 CEILING MOUNTED OCCUPANCY SENSOR WITH 0-10V DAYLIGHT SENSOR DETAIL
NOT TO SCALE



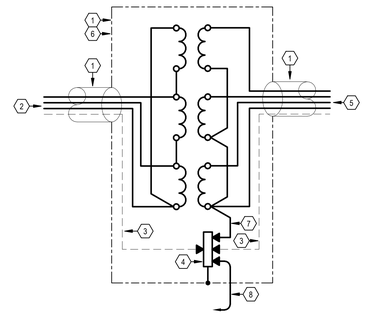

**DETAIL NOTES -**

1. ROUTE GROUNDING CONDUCTOR IN METAL CONDUIT. BOND RACEWAY AT BOTH ENDS TO GROUNDING CONDUCTOR.

**KEYED NOTES -**

1. LOCATE GROUND RODS IN MAIN ELECTRICAL EQUIPMENT ROOM. ONE GROUND ROD SHALL BE LOCATED IN THE NORTHEAST CORNER AND THE OTHER IN THE SOUTHEAST CORNER. THE TOP OF THE GROUND RODS SHALL HAVE 3" EXPOSED ABOVE CONCRETE.
2. COPPER GROUND BUS 1/4"X2"X36" LONG. LOCATION AS INDICATED ON FLOOR PLAN. MOUNT BUS TO WALL ON 2" INSULATED STAND-OFFS.
3. BOND ENCLOSURE PER NEC ARTICLE 250.

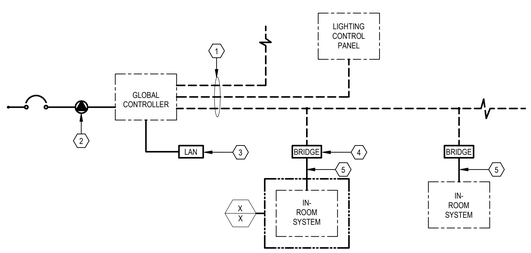
2 SYSTEM GROUNDING DETAIL
NOT TO SCALE



**KEYED NOTES -**

1. TYPICAL EQUIPMENT GROUND CONDUCTORS (RACEWAYS & ENCLOSURES).
2. TRANSFORMER PRIMARY (600 VOLTS OR LESS AS SPECIFIED).
3. SUPPLEMENTAL EQUIPMENT GROUND CONDUCTOR(WHERE SPECIFIED).
4. FORMED BUS OR LUG BONDED TO TRANSFORMER ENCLOSURE. SEE SPECIFICATIONS.
5. TRANSFORMER SECONDARY (600 VOLTS OR LESS AS SPECIFIED).
6. TRANSFORMER ENCLOSURE.
7. BONDING JUMPER PER NEC 250-66
8. GROUNDING ELECTRODE CONDUCTOR TO BUILDING WATER PIPE, BUILDING STEEL, OR AS DIRECTED BY LOCAL AUTHORITY HAVING JURISDICTION.

1 SEPARATELY DERIVED ELECTRICAL SYSTEM GROUNDING
NOT TO SCALE



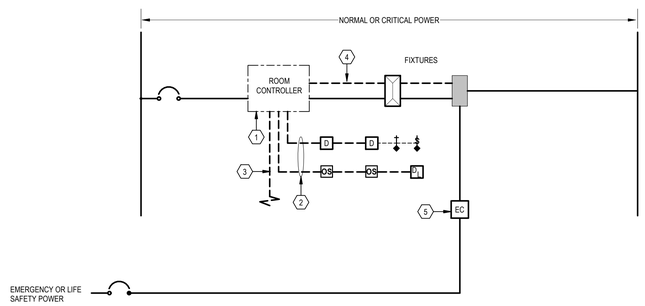

**DETAIL NOTES -**

1. DETAIL INDICATES A GLOBAL NETWORKED DISTRIBUTED CONTROL SYSTEM ONE LINE. PROVIDE THE NECESSARY CONTROL COMPONENTS AND WIRING FOR A COMPLETE SYSTEM. ONE LINE IS DIAGRAMATIC TO SHOW INTENT OF CONNECTIONS BUT DOES NOT SHOW EACH INSTANCE OF CONNECTION TO SYSTEM.
2. REFER TO DISTRIBUTED ROOM CONTROL SCHEDULE AND DIGITAL LOW VOLTAGE SWITCH STATION SCHEDULES FOR MORE INFORMATION WHEN DIGITAL WALL SWITCH STATIONS AND "D-"" CIRCUIT DESIGNATIONS ARE SHOWN ON PLANS. REFER TO SEQUENCE OF OPERATIONS SCHEDULE AND ROOM TAGS FOR MORE INFORMATION ON CONTROL REQUIREMENTS FOR SPACES NOT ON DISTRIBUTED ROOM CONTROL SCHEDULE.
3. SEE FLOOR PLANS FOR QUANTITIES, TYPES AND LOCATIONS OF OCCUPANCY SENSORS.
4. LOCATE IN-ROOM CONTROLLERS ABOVE ENTRY DOOR TO ROOM THEY ARE SERVING, UNLESS OTHERWISE.

**KEYED NOTES -**

1. LOW VOLTAGE NETWORK WIRE. USE MANUFACTURER RECOMMENDED WIRE AND TOPOLOGY.
2. POWER CONNECTION TO MAIN CONTROLLER.
3. TCP/IP CONNECTION TO BUILDING LAN TO ALLOW PROGRAMMING AND OVERRIDE ACCESS TO LIGHTING CONTROL SYSTEM.
4. NETWORK BRIDGE. PROVIDE ONE PER ROOM/AREA DEFINED AS IN - ROOM SYSTEM.
5. LOW VOLTAGE CONNECTION BETWEEN NETWORK BRIDGE AND IN - ROOM SYSTEM. USE MANUFACTURER RECOMMENDED WIRE.

6 TYPICAL NETWORKED DISTRIBUTED CONTROL DETAIL
NOT TO SCALE



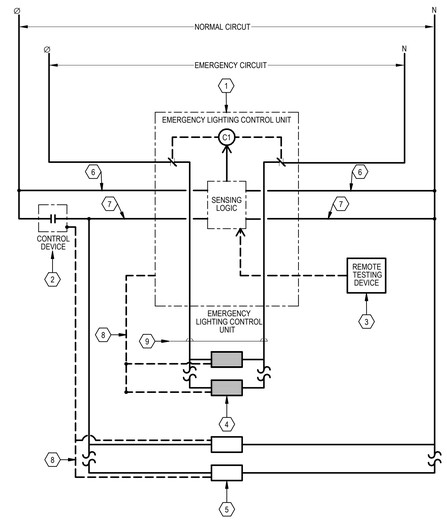

**DETAIL NOTES -**

1. DETAIL INDICATES A TYPICAL STANDALONE DISTRIBUTED CONTROL SYSTEM ONE LINE SERVING ONE ROOM OR AREA. PROVIDE THE NECESSARY CONTROL COMPONENTS AND WIRING FOR A COMPLETE SYSTEM. ONE LINE IS DIAGRAMMATIC TO SHOW INTENT OF CONNECTIONS BUT DOES NOT SHOW EACH INSTANCE OF CONNECTION ON SYSTEM.
2. REFER TO DISTRIBUTED ROOM CONTROL SCHEDULE AND DIGITAL LOW VOLTAGE SWITCH STATION SCHEDULES FOR MORE INFORMATION WHEN DIGITAL WALL SWITCH STATIONS AND "D-"" CIRCUIT DESIGNATIONS ARE SHOWN ON PLANS. REFER TO SEQUENCE OF OPERATIONS SCHEDULE AND ROOM TAGS FOR MORE INFORMATION ON CONTROL REQUIREMENTS FOR SPACES NOT ON DISTRIBUTED ROOM CONTROL SCHEDULE.
3. SEE FLOOR PLANS FOR QUANTITIES, TYPES AND LOCATIONS OF ALL ASSOCIATED DEVICES.

**KEYED NOTES -**

1. PROVIDE REQUIRED ROOM CONTROLLERS NECESSARY TO ACCOMMODATE DIFFERENT VOLTAGES, BRANCH SOURCES, AND CONTROL TYPES AS DESIGN REQUIREMENTS.
2. LOW VOLTAGE CONNECTION FROM LOCAL LOW VOLTAGE DEVICES. USE MANUFACTURER RECOMMENDED WIRE FOR EACH DEVICE TYPE.
3. CONNECTION TO ADDITIONAL ROOM CONTROLLERS SERVING THE SAME AREA.
4. CLASS 2, 0-10V DIMMING WIRES.
5. REFER TO DETAILS ON E500 FOR WIRING DIAGRAM OF UL924 EMERGENCY CONTROL DEVICE

5 TYPICAL DISTRIBUTED IN-ROOM CONTROL DETAIL WITH EGRESS
NOT TO SCALE




**KEYED NOTES -**

1. PROVIDE LVS MODEL EPC-1-D OR EQUIVALENT EMERGENCY LIGHTING CONTROL UNIT. PROVIDE UL924 LISTED DEVICE UNDER NORMAL OPERATING CONDITIONS, THE DESIGNATED EMERGENCY LIGHTS, SERVED FROM EMERGENCY CIRCUIT, WILL FOLLOW NORMAL LIGHTING CONTROLS. UPON LOSS OF NORMAL POWER, THE DESIGNATED EMERGENCY LIGHTS WILL TURN ON TO FULL ILLUMINATION, BYPASSING THE NORMAL LIGHTING CONTROLS.
2. THE NORMAL LIGHTING CONTROL DEVICE CAN CONSIST OF EITHER LINE OR LOW VOLTAGE LIGHTING CONTROLS, 0-10V OR DALI DIMMING, ETC. SEE FLOOR PLANS FOR EXACT CONTROL REQUIREMENTS.
3. PROVIDE A REMOTE TESTING SWITCH FOR EACH EMERGENCY LIGHTING CONTORL UNIT THAT DOES NOT HAVE A SELF-DIAGNOSTIC TEST FEATURE. MOUNT TEST SWITCH ADJACENT TO CONTROL UNIT IN AN ACCESSIBLE LOCATION, OR AS NOTED ON PLANS. FIXTURES, CONTROLLED BY CONTROL UNIT, REQUIRED TO BE VISIBLE FROM TEST SWITCH LOCATION. FIELD VERIFY LOCATION OF REMOTE TEST SWITCH WITH OWNER/ARCHITECT.
4. EMERGENCY LIGHTING FIXTURES. SEE FLOOR PLANS FOR LOCATIONS AND QUANTITIES.
5. NORMAL LIGHTING FIXTURES. SEE FLOOR PLANS FOR LOCATIONS AND QUANTITIES.
6. NORMAL UNSWITCHED SENSING CIRCUIT.
7. NORMAL SWITCH LEG SENSE.
8. PROVIDE DEDICATED RACEWAY FOR ALL WIRING ASSOCIATED TO THE EMERGENCY FIXTURES TO MEET THE APPLICABLE NATIONAL ELECTRICAL CODE - EMERGENCY WIRING REQUIREMENTS.
9. PROVIDE DEDICATED RACEWAY FOR ALL WIRING ASSOCIATED TO THE EMERGENCY FIXTURES TO MEET THE APPLICABLE NATIONAL ELECTRICAL CODE - EMERGENCY WIRING REQUIREMENTS.

E
C

4 EMERGENCY LIGHTING CONTROL UNIT WIRING DIAGRAM - TYPE B
NOT TO SCALE

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
ELECTRICAL DETAILS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E520

03/21/2023 1:52:48 PM

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

## EQUIPMENT SCHEDULE - MECHANICAL

| EQUIPMENT | | LOCATION | | | LOAD | | | FED FROM | | | OCPD | | | FEEDER | | | | MOTOR STARTER | | | | | | DISCONNECT SWITCH | | | | | CONNECTION | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | DESCRIPTION | NAME | VOLTAGE | PHASE | HP | FLA | KVA | PANEL | CIRCUIT | BRANCH | TYPE | SIZE | POLE | QTY | PHASE | GRD | COND | FURN BY | INST BY | WIRE BY | LOC | TYPE | OPTIONS | FURN BY | INST BY | WIRE BY | LOC | OPTIONS | NEMA TYPE | OPTIONS | NOTES |
| MDH-1 | DEHUMIDIFICATION SYSTEM | ROOF | 480 | 3 | 0 | 14.4 A | 12 | MDP/1A | 2 | N | CB | 30 | 3 | 3 | 10 | 10 | 3/4 | MFR | MFR | MFR | IU | | - | EC | EC | EC | NU | 6 | - | 3, 10 | |
| MDSS-1-A1 | DUCTLESS SPLIT SYSTEM | RIVER ROOM | 208 | 3 | 0 | 1.1 A | 0.4 | | | N | - | 15 | 3 | 3 | 12 | 12 | 1/2 | MFR | MFR | MFR | IU | MAN | - | EC | EC | EC | NU | - | - | 3, 10 | INDOOR UNIT IS FED FROM OUTDOOR UNIT. |
| MDSS-1-A2 | DUCTLESS SPLIT SYSTEM | RIVER ROOM | 208 | 3 | 0 | 1.1 A | 0.4 | | | N | - | 15 | 3 | 3 | 12 | 12 | 1/2 | MFR | MFR | MFR | IU | MAN | - | EC | EC | EC | NU | - | - | 3, 10 | INDOOR UNIT IS FED FROM OUTDOOR UNIT. |
| MDSS-1-A3 | DUCTLESS SPLIT SYSTEM | RIVER ROOM | 208 | 3 | 0 | 1.1 A | 0.4 | | | N | - | 15 | 3 | 3 | 12 | 12 | 1/2 | MFR | MFR | MFR | IU | MAN | - | EC | EC | EC | NU | - | - | 3, 10 | INDOOR UNIT IS FED FROM OUTDOOR UNIT. |
| MDSS-1-A4 | DUCTLESS SPLIT SYSTEM | RIVER ROOM | 208 | 3 | 0 | 1.1 A | 0.4 | | | N | - | 15 | 3 | 3 | 12 | 12 | 1/2 | MFR | MFR | MFR | IU | MAN | - | EC | EC | EC | NU | - | - | 3, 10 | INDOOR UNIT IS FED FROM OUTDOOR UNIT. |
| MDSS-1B(1) | DUCTLESS SPLIT SYSTEM | SITE | 208 | 3 | 0 | 48.6 A | 17.5 | DP1/LA | 1 | N | CB | 70 | 3 | 3 | 4 | 8 | 1-1/4 | MFR | MFR | MFR | IU | MAG | - | EC | EC | EC | NU | 6 | - | 3, 10 | |
| MDSS-1B(2) | DUCTLESS SPLIT SYSTEM | SITE | 208 | 3 | 0 | 48.6 A | 17.5 | DP1/LA | 2 | N | CB | 70 | 3 | 3 | 4 | 8 | 1-1/4 | MFR | MFR | MFR | IU | MAG | - | EC | EC | EC | NU | 6 | - | 3, 10 | |
| MDSS-2A | DUCTLESS SPLIT SYSTEM | | 208 | 3 | 0 | 1 A | 0.4 | | | N | - | 15 | 3 | 3 | 12 | 12 | 1/2 | MFR | MFR | MFR | IU | MAN | - | EC | EC | EC | NU | - | - | 3, 10 | INDOOR UNIT IS FED FROM OUTDOOR UNIT. |
| MDSS-2B | DUCTLESS SPLIT SYSTEM | ROOF | 208 | 3 | 0 | 13.6 A | 4.9 | DP1/LA | 3 | N | CB | 20 | 3 | 3 | 10 | 10 | 3/4 | MFR | MFR | MFR | IU | MAG | - | EC | EC | EC | NU | 6 | - | 3, 10 | |
| MTCP | TEMPERATURE CONTROL PANEL | ANNEX | 120 | 1 | 0 | 4.2 A | 0.5 | B | 29 | N | CB | 20 | 1 | 2 | 12 | 12 | 1/2 | - | - | - | - | - | - | - | - | - | - | - | - | 3, 10 | |

## EQUIPMENT SCHEDULE - GENERAL

| EQUIPMENT | | LOCATION | | | LOAD | | | FED FROM | | | OCPD | | | FEEDER | | | | MOTOR STARTER | | | | | | DISCONNECT SWITCH | | | | | CONNECTION | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | DESCRIPTION | NAME | VOLTAGE | PHASE | HP | FLA | KVA | PANEL | CIRCUIT | BRANCH | TYPE | SIZE | POLE | QTY | PHASE | GRD | COND | FURN BY | INST BY | WIRE BY | LOC | TYPE | OPTIONS | FURN BY | INST BY | WIRE BY | LOC | OPTIONS | NEMA TYPE | OPTIONS | NOTES |
| GPO1 | PIZZA OVEN | KITCHEN | 240 | 1 | 0 | 13.3 A | 3.2 | B | 33,35 | N | CB | 20 | 2 | 2 | 12 | 12 | 1/2" | - | - | - | - | - | - | - | - | - | - | - | 6-20 | 1 | VERIFY CONNECTION TYPE, LOAD AND CIRCUIT SIZE WITH OWNER PROVIDED EQUIPMENT. |
| GPO2 | PIZZA OVEN | KITCHEN | 240 | 1 | 0 | 13.3 A | 3.2 | B | 37,39 | N | CB | 20 | 2 | 2 | 12 | 12 | 1/2" | - | - | - | - | - | - | - | - | - | - | - | 6-20 | 1 | VERIFY CONNECTION TYPE, LOAD AND CIRCUIT SIZE WITH OWNER PROVIDED EQUIPMENT. |

### EQUIPMENT SCHEDULE GENERAL NOTES

A. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH OTHER TRADES TO AVOID CONFLICTS AND TO VERIFY ALL EQUIPMENT CONNECTION REQUIREMENTS AND CLEARANCE OF ACCESS POINTS AND DOOR PER THE NEC AND MANUFACTURER REQUIREMENTS.

B. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A COMPLETE ELECTRICAL SYSTEM PER CONTRACT DOCUMENTS AND ENSURING THE SYSTEM IS OPERATIONAL UPON JOB COMPLETION.

C. PROVIDE ALL POWER WIRING INCLUDING ALL CIRCUITRY CARRYING ELECTRICAL ENERGY FROM PANELBOARD OR OTHER SOURCE THROUGH STARTERS AND DISCONNECTS TO MOTORS, PACKAGED EQUIPMENT, OR PACKAGED CONTROLS PANELS. PROVIDE ALL WIRING BETWEEN CONTROL PANELS AND MOTORS. INCLUDE STARTERS DISCONNECTS, AND OVERLOAD PROTECTION IF NOT INCLUDED IN SPECIFICATIONS, COORDINATE WITH EQUIPMENT SUPPLIER.

D. VERIFY ELECTRICAL REQUIREMENTS INCLUDING VOLTAGE, HORSEPOWER, STARTER TYPE, AND DISCONNECTING MEANS FOR MOTORS AND EQUIPMENT PRIOR TO ORDERING CIRCUIT BREAKERS, DISCONNECT SWITCHES, AND STARTERS.

E. THE SHORT CIRCUIT CURRENT RATING (SCCR) IS THE MINIMUM CALCULATED VALUE AT THE UPSTREAM OVERCURRENT PROTECTIVE DEVICE. THE RESPECTIVE CONTRACTOR PROVIDING ANY MOTOR CONTROLLERS, CONTROL PANELS, FUSIBLE DISCONNECT SWITCHES, ETC. ASSOCIATED WITH THIS PIECE OF EQUIPMENT SHALL PROVIDE EQUIPMENT WITH LISTED SHORT CIRCUIT CURRENT RATINGS. EQUIPMENT NAMEPLATE SHALL CLEARLY INDICATE THE UL LISTED SCCR RATING FOR THE EQUIPMENT.

F. WHERE THE HORSEPOWER (HP) COLUMN INDICATES A ZERO (0), THERE IS NO STANDARD HP RATING ASSOCIATED WITH THIS EQUIPMENT. THE OCPD AND CONDUCTOR SIZING ARE BASED UPON THE FLA , KVA AND/OR VENDOR PROVIDED POWER REQUIREMENTS.

### EQUIPMENT SCHEDULE OPTIONS

1 = SINGLE RECEPTACLE
2 = DUPLEX RECEPTACLE
3 = DIRECT CONNECTION
4 = NON-FUSIBLE DISCONNECT
5 = FUSIBLE DISCONNECT
6 = WEATHERPROOF
7 = LOCKABLE
8 = CONCEALED
9 = TOGGLE SWITCH
10 = VERIFY WITH MANUFACTURER PRIOR TO INSTALLATION
11 = SURFACE MOUNTED
12 = FLUSH MOUNTED
13 = GFI RECEPTACLE
14 = GFI BREAKER
15 = LOCKABLE MOTOR RATED SWITCH
13 = GFI RECEPTACLE
14 = GFI BREAKER
15 = LOCKABLE MOTOR RATED SWITCH
16 = SHUNT TRIP BREAKER

### EQUIPMENT SCHEDULE ABBREVIATIONS

N = NORMAL BRANCH
LS = ARTICLE 517, LIFE SAFETY BRANCH
CR = ARTICLE 517, CRITICAL CARE BRANCH
EQ = ARTICLE 517, EQUIPMENT BRANCH
700 = ARTICLE 700, EMERGENCY BRANCH
701 = ARTICLE 701, LEGALLY REQUIRED STANDBY BRANCH
702 = ARTICLE 702, OPTIONAL STANDBY BRANCH
UPS = UNINTERRUPTIBLE POWER SUPPLY

OCPD = OVERCURRENT PROTECTIVE DEVICE
CB = CIRCUIT BREAKER
F = FUSE
BOL = BUILT-IN OVERLOAD

CS = COMBINATION MOTOR CONTROLLER
ECM = ELECTRICALLY COMMUTATED MOTOR
MAG = MAGNETIC MOTOR CONTROLLER
MAN = MANUAL MOTOR CONTROLLER
RVS = REDUCEE VOLTAGE MOTOR CONTROLLER
SS = SOLID STATE MOTOR CONTROLLER
VFD = VARIABLE FREQUENCE DRIVE

IU = IN UNIT
NU = NEAR UNIT
OU = ON UNIT

EC = ELECTRICAL CONTRACTOR
FS = FOOD SERVICE EQUIP. CONTRACTOR
GC = GENERAL CONTRACTOR
MC = MECHANICAL CONTRACTOR
MFR = MANUFACTURER
OWN = OWNER
PC = PLUMBING CONTRACTOR

SA = SEE ARCHITECTURAL DETAILS
SD = SEE DRAWINGS
SFP = SEE FLOOR PLANS
SFS = SEE FOOD SERVICE PLANS

## EXISTING PANEL: K

**FED FROM:** MDP/1
**MAIN SIZE, TYPE:** 100 A MCB
**PANEL BUS AMPS:** 100 AMPS
**PANEL TYPE:** LOAD CENTER
**MANUFACTURER:**

**PANEL LOCATION:** KITCHEN 126
**BRANCH:** N
**VOLTAGE:** 120/240 1 Ø 3 W
**S.C.C.R:** 10kA
**MOUNTING:** RECESSED
**PANEL OPTIONS:**

| CKT | LOAD DESCRIPTION | NOTE | OCPD | POLES | A | | B | | POLES | OCPD | NOTE | LOAD DESCRIPTION | CKT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | EXISTING LOAD | ECB | 15 A | 1 | 0 | 0 | | | 1 | 15 A | ECB | EXISTING LOAD | 2 |
| 3 | EXISTING LOAD | ECB | 20 A | 1 | | | 0 | 0 | 1 | 20 A | ECB | EXISTING LOAD | 4 |
| 5 | EXISTING LOAD | ECB | 20 A | 1 | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 6 |
| 7 | EXISTING LOAD | ECB | 20 A | 1 | | | 0 | 0 | 1 | 20 A | ECB | EXISTING LOAD | 8 |
| 9 | RCPT | NCB | 20 A | 1 | 0.18 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 10 |
| 11 | RCPT FIREFLY ROOM 125 | NCB | 20 A | 1 | | | 0.18 | -- | 1 | -- | | SPACE | 12 |
| 13 | RCPT FIREFLY ROOM 125 | | 20 A | 1 | 0.18 | -- | | | 1 | -- | | SPACE | 14 |
| 15 | RCPT FIREFLY ROOM 125 | NCB | 20 A | 1 | | | 0.18 | -- | 1 | -- | | SPACE | 16 |
| 17 | RCPT FIREFLY ROOM 125 | | 20 A | 1 | 0.18 | -- | | | 1 | -- | | SPACE | 18 |
| 19 | SPACE | NCB | -- | 1 | | | -- | -- | 1 | -- | | SPACE | 20 |
| | | | | | **Total Load:** | | 0.54 kVA | 0.36 kVA | | | | | |
| | | | | | **Total Amps:** | | 4.5 A | 3 A | | | | | |

| LOAD CLASSIFICATION | CONNECTED LOAD | N.E.C. DEMAND LOAD | PANEL TOTALS | |
|---|---|---|---|---|
| RCPT | 0.9 kVA | 0.9 kVA | | |
| | | | **CONNECTED LOAD:** | 0.9 kVA |
| | | | **N.E.C. DEMAND LOAD:** | 0.9 kVA |
| | | | **CONNECTED CURRENT:** | 3.8 A |
| | | | **N.E.C. DEMAND CURRENT:** | 3.8 A |

**NOTES:**

## EXISTING PANEL: B

**FED FROM:**
**MAIN SIZE, TYPE:** 200 A MAIN CB
**PANEL BUS AMPS:** 200 AMPS
**PANEL TYPE:** BRANCH
**MANUFACTURER:** SQUARE D

**PANEL LOCATION:** ELEC 124
**BRANCH:** N
**VOLTAGE:** 120/240 1 Ø 3 W
**S.C.C.R:** 10kA
**MOUNTING:** SURFACE
**PANEL OPTIONS:**

| CKT | LOAD DESCRIPTION | NOTE | OCPD | POLES | A | | B | | POLES | OCPD | NOTE | LOAD DESCRIPTION | CKT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 2 |
| 3 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 4 |
| 5 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 6 |
| 7 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 8 |
| 9 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 10 |
| 11 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 12 |
| 13 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 14 |
| 15 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 16 |
| 17 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 18 |
| 19 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 20 |
| 21 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 22 |
| 23 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 24 |
| 25 | RCPT FIREFLY ROOM-1 125-1 | NCB | 20 A | 1 | 0.36 | 0 | | | 1 | 20 A | | EXISTING LOAD | 26 |
| 27 | RCPT FIREFLY ROOM-1 125-1 | NCB | 20 A | 1 | | | 0.54 | 0 | 1 | 20 A | | EXISTING LOAD | 28 |
| 29 | Equipment ANNEX 130 | NCB | 20 A | 1 | 0.5 | 0 | | | 1 | 20 A | | EXISTING LOAD | 30 |
| 31 | RCPT FIREFLY ROOM 125 | NCB | 20 A | 1 | | | 0.18 | 0 | 1 | 20 A | | EXISTING LOAD | 32 |
| 33 | Equipment KITCHEN 126 | NCB | 20 A | 2 | 1.6 | 0 | | | 1 | 20 A | | EXISTING LOAD | 34 |
| 35 | | | | | | | 1.6 | -- | 1 | -- | | SPACE | 36 |
| 37 | Equipment KITCHEN 126 | NCB | 20 A | 2 | 1.6 | -- | | | 1 | -- | | SPACE | 38 |
| 39 | | | | | | | 1.6 | -- | 1 | -- | | SPACE | 40 |
| 41 | SPACE | | -- | 1 | -- | -- | | | 1 | -- | | SPACE | 42 |
| | | | | | **Total Load:** | | 4.06 kVA | 3.92 kVA | | | | | |
| | | | | | **Total Amps:** | | 33.8 A | 32.7 A | | | | | |

| LOAD CLASSIFICATION | CONNECTED LOAD | N.E.C. DEMAND LOAD | PANEL TOTALS | |
|---|---|---|---|---|
| Equipment | 6.9 kVA | 6.9 kVA | | |
| RCPT | 1.08 kVA | 1.08 kVA | | |
| | | | **CONNECTED LOAD:** | 7.98 kVA |
| | | | **N.E.C. DEMAND LOAD:** | 7.98 kVA |
| | | | **CONNECTED CURRENT:** | 33.3 A |
| | | | **N.E.C. DEMAND CURRENT:** | 33.3 A |

**NOTES:**

## EXISTING PANEL: A

**FED FROM:** MDP/1
**MAIN SIZE, TYPE:** MLO
**PANEL BUS AMPS:** 225 AMPS
**PANEL TYPE:** BRANCH
**MANUFACTURER:** SQUARE D NQO

**PANEL LOCATION:** ELEC 124
**BRANCH:** N
**VOLTAGE:** 120/240 1 Ø 3 W
**S.C.C.R:** 10kA
**MOUNTING:** SURFACE
**PANEL OPTIONS:**

| CKT | LOAD DESCRIPTION | NOTE | OCPD | POLES | A | | B | | POLES | OCPD | NOTE | LOAD DESCRIPTION | CKT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | EXISTING LOAD | ECB | 20 A | 1 | 0 | 0.18 | | | 1 | 20 A | NCB | RCPT VESTIBULE 122 | 2 |
| 3 | EXISTING LOAD | ECB | 20 A | 1 | | | 0 | 0.54 | 1 | 20 A | NCB | RCPT | 4 |
| 5 | EXISTING LOAD | ECB | 20 A | 1 | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 6 |
| 7 | EXISTING LOAD | ECB | 30 A | 2 | | | 0 | 0 | 1 | 20 A | ECB | EXISTING LOAD | 8 |
| 9 | | | | | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 10 |
| 11 | EXISTING LOAD | ECB | 30 A | 2 | | | 0 | 0 | 1 | 20 A | ECB | EXISTING LOAD | 12 |
| 13 | | | | | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 14 |
| 15 | EXISTING LOAD | ECB | 20 A | 1 | | | 0 | 0.54 | 1 | 20 A | NCB | RCPT FIREFLY ROOM-1 125-1 | 16 |
| 17 | EXISTING LOAD | ECB | 20 A | 1 | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 18 |
| 19 | EXISTING LOAD | ECB | 20 A | 1 | | | 0 | 0 | 1 | 20 A | ECB | EXISTING LOAD | 20 |
| 21 | EXISTING LOAD | ECB | 20 A | 1 | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 22 |
| 23 | EXISTING LOAD | ECB | 20 A | 1 | | | 0 | 0 | 1 | 20 A | ECB | EXISTING LOAD | 24 |
| 25 | EXISTING LOAD | ECB | 20 A | 1 | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 26 |
| 27 | EXISTING LOAD | ECB | 20 A | 1 | | | 0 | 0 | 1 | 20 A | ECB | EXISTING LOAD | 28 |
| 29 | EXISTING LOAD | ECB | 20 A | 1 | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 30 |
| 31 | EXISTING LOAD | ECB | 20 A | 1 | | | 0 | 0 | 1 | 20 A | ECB | EXISTING LOAD | 32 |
| 33 | EXISTING LOAD | ECB | 20 A | 1 | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 34 |
| 35 | EXISTING LOAD | ECB | 30 A | 2 | | | 0 | 0 | 1 | 20 A | ECB | EXISTING LOAD | 36 |
| 37 | | | | | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 38 |
| 39 | EXISTING LOAD | ECB | 30 A | 2 | | | 0 | 0 | 1 | 20 A | ECB | EXISTING LOAD | 40 |
| 41 | | | | | 0 | 0 | | | 1 | 20 A | ECB | EXISTING LOAD | 42 |
| | | | | | **Total Load:** | | 0.18 kVA | 1.08 kVA | | | | | |
| | | | | | **Total Amps:** | | 1.5 A | 9 A | | | | | |

| LOAD CLASSIFICATION | CONNECTED LOAD | N.E.C. DEMAND LOAD | PANEL TOTALS | |
|---|---|---|---|---|
| RCPT | 1.26 kVA | 1.26 kVA | | |
| | | | **CONNECTED LOAD:** | 1.26 kVA |
| | | | **N.E.C. DEMAND LOAD:** | 1.26 kVA |
| | | | **CONNECTED CURRENT:** | 5.3 A |
| | | | **N.E.C. DEMAND CURRENT:** | 5.3 A |

**NOTES:**

## EXISTING PANEL: D

**FED FROM:**
**MAIN SIZE, TYPE:** MLO
**PANEL BUS AMPS:** 225 AMPS
**PANEL TYPE:** BRANCH
**MANUFACTURER:** SQUARE D

**PANEL LOCATION:**
**BRANCH:**
**VOLTAGE:** 120/240 1 Ø 3 W
**S.C.C.R:** 10kA
**MOUNTING:** SURFACE
**PANEL OPTIONS:**

| CKT | LOAD DESCRIPTION | NOTE | OCPD | POLES | A | | B | | POLES | OCPD | NOTE | LOAD DESCRIPTION | CKT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 2 |
| 3 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 4 |
| 5 | EXISTING LOAD | | 20 A | 1 | 0 | 0.72 | | | 1 | 20 A | | RCPT PARK VIEW ROOM 102 | 6 |
| 7 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 8 |
| 9 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 10 |
| 11 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 12 |
| 13 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 14 |
| 15 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 16 |
| 17 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 18 |
| 19 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 20 |
| 21 | EXISTING LOAD | | 30 A | 2 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 22 |
| 23 | | | | | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 24 |
| 25 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 26 |
| 27 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 28 |
| 29 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 30 |
| 31 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 32 |
| 33 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 34 |
| 35 | EXISTING LOAD | | 20 A | 1 | | | 0 | 0 | 1 | 20 A | | EXISTING LOAD | 36 |
| 37 | EXISTING LOAD | | 20 A | 1 | 0 | 0 | | | 1 | 20 A | | EXISTING LOAD | 38 |
| 39 | EXISTING LOAD | | 30 A | 2 | | | 0 | 0.36 | 1 | 20 A | | RCPT | 40 |
| 41 | | | | | 0 | 0.18 | | | 1 | 20 A | | RCPT | 42 |
| | | | | | **Total Load:** | | 0.9 kVA | 0.36 kVA | | | | | |
| | | | | | **Total Amps:** | | 7.5 A | 3 A | | | | | |

| LOAD CLASSIFICATION | CONNECTED LOAD | N.E.C. DEMAND LOAD | PANEL TOTALS | |
|---|---|---|---|---|
| RCPT | 1.26 kVA | 1.26 kVA | | |
| | | | **CONNECTED LOAD:** | 1.26 kVA |
| | | | **N.E.C. DEMAND LOAD:** | 1.26 kVA |
| | | | **CONNECTED CURRENT:** | 5.3 A |
| | | | **N.E.C. DEMAND CURRENT:** | 5.3 A |

**NOTES:**

### PANEL SCHEDULE ABBREVIATIONS AND OPTIONS

ABBREVIATIONS:
ACC = CIRCUIT BREAKER ACCESSORIES
ECB = EXISTING CIRCUIT BREAKER
FM = FLUSH MOUNTED
PM = PAD MOUNTED
SM = SURFACE MOUNTED
MLO = MAIN LUGS ONLY
MCB = MAIN CIRCUIT BREAKER
NCB = NEW CIRCUIT BREAKER
OPT = CIRCUIT BREAKER OPTIONS
SFP = SEE FLOOR PLAN
SD = SEE ONELINE DIAGRAM

CIRCUIT BREAKER OPTIONS:
ALS = ALARM SWITCH
AXS = AUXILIARY SWITCH
EOP = ELECTRICAL OPERATOR
ST = SHUNT TRIP
UVT = UNDER VOLTAGE TRIP
CCB = CONTROLLABLE CIRCUIT BREAKER

CIRCUIT TYPES:
MC = MOLDED CASE
SS = SOLID STATE

CIRCUIT BREAKER ACCESSORIES:
AF = ARC FAULT CIRCUIT INTERRUPTER (RESIDENTIAL ONLY)
AR = ARC FLASH REDUCTION
CL = CURRENT LIMINTIN
FR = FULLY RATED (100%)
GE = GROUND FAULT PROTECTION (EQUIPMENT)
GP = GROUND FAULT PROTECTION (PERSONNEL)
GS = GROUND FAULT SENSING/ALARM
HC = HEATING, COOLING, AC, REFRIGERATION (HCAR)
HM = HIGH MAGNETIC (HID MOTORS)
MS = MOLDED CASE SWITCH
MP = MOTOR CIRCUIT PROTECTOR
L1 = LONG TIME/INSTANTANEOUS(LI)
L2 = LONG TIME/SHORT TIME/INST.(LSI)
L3 = LONG TIME/SHORT TIME/INST./GROUND FAULT TRIP(LSIG)
L4 = LONG TIME/SHORT TIME/INST./GROUND FAULT SENSING(LSIA)
SC = SYSTEM COMMUNICATION
SD = SYSTEM DIAGNOSTICS
SM = SYSTEM MONITORING
ZS = ZONE SELECTIVE INTERLOCKING

PANEL OPTIONS:
1 = 200% NEUTRAL
2 = ISOLATED GROUND BUS
3 = DUAL MAIN LUGS
4 = FEED THROUGH LUGS

PANEL TYPES:
P = POWER PANEL CONSTRUCTION
B = BRANCH PANEL CONSTRUCTION
L = LOAD CENTER CONSTRUCTION
CB = CONTROLLABLE BRANCH PANEL

*REFER TO ONE-LINE DIAGRAM GENERAL NOTES FOR ADDITIONAL INFORMATION ON AIC RATING.

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
ELECTRICAL SCHEDULES

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E601

12/21/2023 1:52:43 PM

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

# LIGHT FIXTURE SCHEDULE

| FIXTURE | | LIGHT SOURCE | | | | | | BALLASTS/DRIVERS | | | INPUT | VOLT | MOUNT | SURFACE | FIXTURE | FIXTURE SPECIFICATION AND ACCEPTABLE MANUFACTURERS | | OPTIONS | SEE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ID | DESCRIPTION | TYPE | NO. | DESCRIPTION | WATTS | K | CRI (MIN.) | TYPE | CONTROL | CIRCUITS | WATTS | | | TYPE | DEPTH | MANUFACTURER | CATALOG SERIES | | NOTE |
| AS | 2X4 VOLUMETRIC TROFFER<br>CURVED CENTER LENS | LED | - | 4500<br>DELIVERED<br>LUMENS | 39 | 3500 | 80 | DR | DIM10 | 1 | 39 | UNV | R | LG | <4" | COLUMBIA | LCAT24-35-ML-G-ED-U | 1 | 1C |
| DA | 4" DIA DOWNLIGHT<br>50 DEG DISTRIBUTION<br>WHITE BEZEL & WHITE TRIM | LED | - | 2000<br>DELIVERED<br>LUMENS | 16 | 3500 | 80 | DR | DM1 | 1 | 16 | UNV | R | V | <5" | ALPHABET | NU4-RD-SW-20LM-35K-80-50D-CL-<br>WH-WH-NC-UNV-DIM10 | | 1D |
| DB | 4" DIA DOWNLIGHT<br>WALL WASH DISTRIBUTION<br>WHITE BEZEL & WHITE TRIM | LED | - | 2000<br>DELIVERED<br>LUMENS | 16 | 3500 | 80 | DR | DM1 | 1 | 16 | UNV | R | V | <5" | ALPHABET | NJ4-RW-SW-25LM-35K-80-WW-<br>WH-WH-NC-UNV-DIM10 | | 1D |
| DC | 2" DIA DOWNLIGHT<br>40 DEG DISTRIBUTION | LED | - | 700<br>DELIVERED<br>LUMENS | 9 | 3500 | 80 | DR | DM1 | 1 | 9 | UNV | R | V | <6" | ALPHABET | 624-RD-SW-10LM-35K-80-D40-UNV-<br>DIM10-NC-*FINISH* | | 1D |
| DD | 3" DIA DOWNLIGHT<br>DECORATIVE DROP RING | LED | - | 850<br>DELIVERED<br>LUMENS | 16 | 3500 | 80 | DR | DM1 | 1 | 16 | UNV | R | V | <6" | ALPHABET | NU3-RD-SW-15LM-35K-80-CQR-D40-<br>WH-NC-UNV-DIM10 | | 1D |
| DE | 4" DIA DOWNLIGHT<br>65 DEG DISTRIBUTION<br>WHITE BEZEL & WHITE TRIM | LED | - | 1500<br>DELIVERED<br>LUMENS | 12 | 3500 | 80 | DR | DM1 | 1 | 12 | UNV | R | V | <5" | ALPHABET | NU4-RD-SW-15LM-35K-80-65D-CL-<br>WH-WH-NC-UNV-DIM10 | | 1D |
| FL | 4' CLOSET LIGHT<br>LENSED SHIELDING<br>INTEGRAL OCCUPANCY SENSOR | LED | - | 2500<br>DELIVERED<br>LUMENS | 18 | 3500 | 80 | DR | SW | 1 | 18 | UNV | S | W | - | COLUMBIA | MPS-4-35-XW-CP-W-E-U-ODPG | 1,55 | 1C |
| LA | 5" WIDE LINEAR SUSPENDED<br>DIRECT/INDIRECT BATWING DISTRIBUTION<br>SOFT DIFFUSE LENSING | LED | - | 1250 DN / 1350 UP<br>DELIVERED<br>LUMENS PER FT. | 11 W DN /<br>10 W UP<br>PER FT. | 3500 | 80 | DR | DM1 | 2 | 11 W DN /<br>10 W UP<br>PER FT. | UNV | SUSP | WD | - | LITECONTROL | 4L-P-ID-LPA-*LENGTH*-08-SOF-<br>*FINISH*-35K9-I135-D125-D01-2C-<br>UNV-*SUSPENSION*-W2-L1 | 1,24,26,28,36,37 | 1I, 2, 3, 4, 5, 6 |
| LB | 5" WIDE LINEAR SUSPENDED<br>DIRECT/INDIRECT BATWING DISTRIBUTION<br>SOFT DIFFUSE LENSING | LED | - | 1000 DN / 1350 UP<br>DELIVERED<br>LUMENS PER FT. | 8 W DN/<br>10 W UP<br>PER FT. | 3500 | 80 | DR | DM1 | 2 | 8 W DN/<br>10 W UP<br>PER FT. | UNV | SUSP | WD | - | LITECONTROL | 4L-P-ID-LPA-*LENGTH*-08-SOF-<br>*FINISH*-35K9-I135-D100-D01-2C-<br>UNV-*SUSPENSION*-W2-L1 | 1,24,26,28,36,37 | 1I, 2, 3, 4, 5, 6 |
| PA | 6' DIA x 1.5" W RING PENDANT<br>DIRECT DISTRIBUTION<br>DIFFUSED ACRYLIC SHIELDING | LED | - | 6700<br>DELIVERED<br>LUMENS | 110 | 3500 | 80 | DR | DM1 | 1 | 110 | UNV | SUSP | DW | - | ALW | MR1.5/TS-D6-SS-LOW-80-3500K-V01-<br>LENS-N-N-N-*FINISH*-UNV-N | 1,28,36,37,58 | 1I |
| PB | 8' DIA x 1.5" W RING PENDANT<br>DIRECT DISTRIBUTION<br>DIFFUSED ACRYLIC SHIELDING | LED | - | 9000<br>DELIVERED<br>LUMENS | 147 | 3500 | 80 | DR | DM1 | 1 | 147 | UNV | SUSP | DW | - | ALW | MR1.5/TS-D8-SS-LOW-80-3500K-V01-<br>LENS-N-N-N-*FINISH*-UNV-N | 1,28,36,37,58 | 1I |
| SA | 3' DIA x 1.5" W RING PENDANT<br>DIRECT DISTRIBUTION<br>DIFFUSED ACRYLIC SHIELDING | LED | - | 3300<br>DELIVERED<br>LUMENS | 54 | 3500 | 80 | DR | DM1 | 1 | 54 | UNV | S | DW | - | ALW | MR1.5-D3-CM-LOW-80-3500K-V01-<br>LENS-N-N-N-*FINISH*-UNV-N | 1,28,58 | 1I |
| TA | NOMINAL 3" DIA x 5" CYLINDER LOW VOLTAGE<br>TRACK HEAD<br>20 DEG DISTRIBUTION | LED | - | 1500<br>DELIVERED<br>LUMENS | 17 | 3500 | 90 | DR | ELV | 1 | 17 | 120 | S | TRACK | - | BRUCK | GX15-15LM-35K-90-20D-120-ELV-<br>ECOH-WH-SNOOT-WH | | 1E |
| T1 | LINE VOLTAGE TRACK<br>SINGLE CIRCUIT | - | - | - | - | - | - | - | | 1 | - | 120 | S | DW | - | BRUCK | ECO H TRACK<br>370GES-208-WH-370GES-41-WH | 59 | 1E |
| XH | EXIT SIGN - SINGLE FACE THERMOPLASTIC<br>HOUSING; UNIVERSAL MOUNTING | LED | - | IN UNIT | 3 | - | - | - | - | - | 3 | UNV | S | V | - | LITHONIA | LQM-S-3-R-MVOLT | 61,62 | 1K |

NOTE:
SEE SPECIFICATION SECTIONS 26 50 00 FOR ADDITIONAL INFORMATION REGARDING LIGHTING FIXTURE AND INSTALLATION REQUIREMENTS. PROVIDE OPTIONS AND ACCESSORIES REFERENCED BY THE COLUMN TITLED "OPTIONS".
MANUFACTURERS AS ACCEPTABLE SHALL MEET ALL REQUIREMENTS AND FEATURES INDICATED. ACCEPTABLE MANUFACTURERS MUST MEET THE PHOTOMETRIC PERFORMANCE OF THE LISTED UNIT.

ABBREVIATIONS:

AR = AS REQUIRED
BL = BI-LEVEL SWITCHING
BT = BLUETOOTH
CAB = UNDERCABINET
CL = CLEAR
DALI = ADDRESSABLE, DIMMING <1-100%
DM0 = LED DIMMING 0-10V, 0 -100%
DM1 = LED DIMMING 0-10V, 1 -100%
DM5 = LED DIMMING 0-10V, 5 -100%
DM10 = LED DIMMING 0-10V, 10 -100%
DMW = DIM TO WARM LED
DMX = ADDRESSABLE, DIMMING <1-100%
DR = DRIVER
DW = DRYWALL
ELV = ELECTRONIC LOW VOLTAGE DIMMING
EM = EMERGENCY
ES = EXPOSED STRUCTURE
ET = ELECTRONIC BALLAST
F = FLUORESCENT
FD1 = FLUORESCENT DIMMING 1-100%
FD5 = FLUORESCENT DIMMING 5-100%
FD10 = FLUORESCENT DIMMING 10-100%
GRD = GRADE
H = HID
HAL = HALOGEN
HBF = HIGH BALLAST FACTOR
I = INCANDESCENT
LBF = LOW BALLAST FACTOR
LG = LAY-IN GRID
MLV = MAGNETIC LOW VOLTAGE DIMMING
NBF = NORMAL BALLAST FACTOR
OT = OTHER
PD = PENDANT
POE = POWER OVER ETHERNET
PL = PLASTER
PS = PULSE START
R = RECESS
RGB = RED, GREEN, BLUE LEDS
RM = REMOTE
S = SURFACE
SPEC = SPECIAL
ST = STANDARD
STN = STONE
SUSP = SUSPENDED
SW = SWITCHING
T = CERAMIC/GLASS TILE
TW = TUNABLE WHITE LED
V = VARIES
W = WALL MOUNTED
WD = WOOD
WR = WIRELESS
XFMR = TRANSFORMER

OPTIONS:

1 = POST PAINTED FINISH
2 = REGRESSED ALUMINUM DOOR FRAME
3 = FLAT STEEL DOOR FRAME
4 = FLAT ALUMINUM DOOR FRAME - MITERED CORNERS
5 = STAINLESS STEEL TRIM AND DOOR FRAME
6 = FURNISH WITH SPRING LOADED LATCHES
7 = FURNISH WITH HINGED DOOR
8 = DAMP LOCATION CONSTRUCTION
9 = WET LOCATION CONSTRUCTION
10 = IP65 RATING
11 = IP66 RATING
12 = IP67 RATING
13 = NEMA 4X RATED
14 = IC RATING
15 = ADA COMPLIANT
16 = DOUBLE GASKETED-LENS TO TRIM TO CEILING
17 = TRIPLE GASKETED-LENS TO DOOR TO HOUSING TO CEILING
18 = FURNISH WITH TAMPER RESISTANT HARDWARE
19 = AIR TIGHT
20 = SPARE
21 = FURNISH WITH AIR HANDLING CAPABILITY
22 = FURNISH WITH WIRE GUARD
23 = FURNISH WITH ENDCAPS
24 = FURNISH IN LENGTH AS SHOWN
25 = FURNISH WITH SOLID FRONT
26 = FURNISH WITH DUST COVER
27 = CUSTOM FINISH - SELECTION TBD
28 = STANDARD FINISH - SELECTION TBD
29 = FURNISH WITH HOUSE SIDE SHIELD
30 = FURNISH IN CUSTOM CONFIGURATION-REFER TO PLANS
31 = SPARE
32 = FURNISH WITH POWER OVER AIRCRAFT CABLE
33 = FURNISH WITH CHAIN MOUNTING
34 = FURNISH WITH RIGID STEM MOUNTING
35 = FURNISH WITH SWIVEL CANOPY
36 = FURNISH WITH ADJUSTABLE AIRCRAFT CABLE MOUNTING
37 = FURNISH WITH ADJUSTABLE MOUNTING HARDWARE
38 = FURNISH WITH MANUFACTURER'S CUSTOM JUNCTION BOX
39 = FURNISH WITH RECESSED SLOPE ADAPTER
40 = FURNISH WITH CORD MOUNTING
41 = MATTE DIFFUSE LOW IRIDESCENT REFL.
42 = FURNISH WITH SYMMETRICAL REFLECTOR
43 = FURNISH WITH ASYMMETRICAL REFLECTOR
44 = FURNISH WITH TOP AND BOTTOM LENS
45 = FURNISH WITH LOUVER
46 = FURNISH WITH PERFORATED DIFFUSER
47 = FURNISH WITH EGGCRATE LOUVER
48 = FURNISH WITH SOFTENING LENS
49 = FURNISH WITH PRISMATIC LENS
50 = FURNISH WITH LINEAR SPREAD LENS
51 = FURNISH WITH SPREAD LENS
52 = SPARE
53 = SPARE
54 = FURNISH WITH ROCKER SWITCH
55 = FURNISH WITH INTEGRAL OCC. SENSOR
56 = FURNISH WITH INTEGRAL DAYLIGHT SENSOR
57 = FURNISH WITH INTEGRAL PHOTOCELL
58 = FURNISH WITH REMOTE DRIVER
59 = FURNISH WITH CURRENT LIMITING DEVICE
60 = FURNISH QUANTITY OF DRIVERS AS REQUIRED
61 = FURNISH WITH UNIVERSAL ARROWS AND RED STENCIL FACE
62 = FURNISH WITH FIELD ADJUSTABLE CHEVRONS
63 = FURNISH WITH MIRRORED BACKGROUND
64 = FURNISH WITH INTEGRAL BATTERY
65 = FURNISH WITH INTEGRAL HIGH CAPACITY BATTERY (FOR REMOTE HEADS)
66 = FURNISH WITH SELF DIAGNOSTICS
67 = FURNISH WITH AUXILIARY EMERGENCY BATTERY BALLAST/DRIVER
68 = SPARE
69 = SPARE
70 = SPARE
71 = FURNISH WITH ANTI-MICROBIAL FINISH
72 = CERTIFIED FOR MIL-STD461F
73 = FURNISH WITH RF NOISE SUPPRESSORS (ADVANCE RIF-1) FOR EACH DRIVER
74 = FURNISH WITH ACRYLIC LENS WITH INTEGRAL RFI SHIELDING
75 = FURNISH WITH LOW VOLTAGE CONTROL (LVC)
76 = SPARE
77 = SPARE
78 = SPARE
79 = SPARE
80 = SPARE

## GENERAL NOTES:

1. VERIFY CEILING T-BAR WIDTH (I.E. 9/16", 15/16", 1.5") WITH THE ARCHITECT/INTERIORS SPECIFICATION PRIOR TO ORDERING LAY-IN FIXTURES.
2. IN ALL INSULATED OR FIRE RATED CEILINGS, THE EC SHALL BE RESPONSIBLE FOR THE PROPER TENTING (OR FIRE BOXING) OF THE RECESSED FIXTURES. FOR PREFAB PRODUCTS REFER TO TENMAT OR SPECIALTY PRODUCTS AND INSULATION.
3. VERIFY DIMMING BALLAST / DRIVER COMPATIBILITY WITH DIMMING CONTROL.
4. REFER TO ARCHITECTURAL ELEVATIONS FOR EXACT LOCATION AND MOUNTING HEIGHT.
5. TO MEET SPECIFIED DELIVERED LUMEN PACKAGE PROVIDE PROGRAMMED DRIVER AS REQUIRED.
6. FIXTURE PERFORMANCE TOLERANCES: CCT +/- 200 DEGREES; DELIVERED LUMENS +/- 5%; ENERGY CONSUMPTION +/- 5%; BEAM SPREAD DISTRIBUTION +/- 5 DEGREES AND AS OUTLINED IN 26 50 00.
7. IF SUBMITTING A FIXTURE FOR APPROVAL AS AN EQUAL, PROVIDE CUT SHEET AND IES PHOTOMETRIC FILE PRIOR TO BIDDING. A WORKING SAMPLE OF THE FIXTURE IS REQUIRED FOR APPROVAL BY THE A/E.

**LIGHT FIXTURE SCHEDULE CONTINUED ON SHEET E603**

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
ELECTRICAL SCHEDULES

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E602

12/21/2023 1:52:43 PM

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00

LIGHT FIXTURE SCHEDULE CONTINUED FROM SHEET E602

## DISTRIBUTED LOW VOLTAGE SWITCH STATION SCHEDULE

| LOCATION | DESIGNATION | BUTTON | ZONES CONTROLLED | DESCRIPTIONS | SEE NOTE |
|---|---|---|---|---|---|
| FIREFLY ROOM 125 | 1.01 | 5 | D-1, D-2 | KITCHEN | 1,2 |
| | | | D-3 | COUNTER DOWNLIGHTS | 1,2 |
| | | | D-4, D-5, D-6, D-7, D-8 | CURLING CLUB | 1,2 |
| | | | D-4, D-5, D-6, D-7, D-8 | SENIOR CENTER | 1,2 |
| | | | D-4, D-5, D-6, D-7, D-8 | EVENT | 1,2 |
| FIREFLY ROOM 125 | 1.02 | 5 | D-1, D-2 | KITCHEN | 1,2 |
| | | | D-3 | COUNTER DOWNLIGHTS | 1,2 |
| | | | D-4, D-5, D-6, D-7, D-8 | CURLING CLUB | 1,2 |
| | | | D-4, D-5, D-6, D-7, D-8 | SENIOR CENTER | 1,2 |
| | | | D-4, D-5, D-6, D-7, D-8 | EVENT | 1,2 |
| FIREFLY ROOM 125 | 1.03 | 5 | D-1, D-2 | KITCHEN | 1,2 |
| | | | D-3 | COUNTER DOWNLIGHTS | 1,2 |
| | | | D-4, D-5, D-6, D-7, D-8 | CURLING CLUB | 1,2 |
| | | | D-4, D-5, D-6, D-7, D-8 | SENIOR CENTER | 1,2 |
| | | | D-4, D-5, D-6, D-7, D-8 | EVENT | 1,2 |
| TOSA ROOM 106 | 1.04 | 3 | D-9, D-10, D-11, D-12, D-13, D-14, D-15, D-16, D-17, D-18 | CURLING | 1,2 |
| | | | D-9, D-10, D-11, D-12, D-13, D-14, D-15, D-16, D-17, D-18 | DAYTIME EVENT | 1,2 |
| | | | D-9, D-10, D-11, D-12, D-13, D-14, D-15, D-16, D-17, D-18 | NIGHTTIME EVENT | 1,2 |
| TOSA ROOM 106 | 1.05 | 3 | D-9, D-10, D-11, D-12, D-13, D-14, D-15, D-16, D-17, D-18 | CURLING | 1,2 |
| | | | D-9, D-10, D-11, D-12, D-13, D-14, D-15, D-16, D-17, D-18 | DAYTIME EVENT | 1,2 |
| | | | D-9, D-10, D-11, D-12, D-13, D-14, D-15, D-16, D-17, D-18 | NIGHTTIME EVENT | 1,2 |
| RIVER ROOM 206 | 2.01 | 3 | D-19, D-20, D-21, D-22, D-23 | DAYTIME EVENT | 1,2 |
| | | | D-19, D-20, D-21, D-22, D-23 | NIGHTTIME EVENT | 1,2 |
| | | | D-19, D-20, D-21, D-22, D-23 | MEETING | 1,2 |
| RIVER ROOM 206 | 2.02 | 3 | D-19, D-20, D-21, D-22, D-23 | DAYTIME EVENT | 1,2 |
| | | | D-19, D-20, D-21, D-22, D-23 | NIGHTTIME EVENT | 1,2 |
| | | | D-19, D-20, D-21, D-22, D-23 | MEETING | 1,2 |
| RIVER ROOM 206 | 2.03 | 3 | D-19, D-20, D-21, D-22, D-23 | DAYTIME EVENT | 1,2 |
| | | | D-19, D-20, D-21, D-22, D-23 | NIGHTTIME EVENT | 1,2 |
| | | | D-19, D-20, D-21, D-22, D-23 | MEETING | 1,2 |

## DISTRIBUTED LOW VOLTAGE SWITCH STATION GENERAL NOTES:

1. REFER TO DISTRIBUTED IN-ROOM CONTROL SCHEDULE FOR MORE INFORMATION.
2. CONFIRM ALL SCENES/GROUPS WITH ARCHITECT AND OWNER DURING ON SITE PROGRAMMING.
3. DESCRIPTIONS ARE SUGGESTED BUTTON LABELS, OWNER TO CONFIRM SWITCH LABELS PRIOR TO ORDER RELEASE.

## DISTRIBUTED LOW VOLTAGE SWITCH STATION SCHEDULE NOTES:

1. PROGRAM SWITCH BUTTON AS A PRESET SCENE, WHICH MAY INCLUDE MULTIPLE ZONES AND DIFFERENT DIMMED LEVELS OF THOSE ZONES.

## SEQUENCE OF OPERATIONS

### GENERAL NOTES:

1. REFER TO PLANS FOR APPLICATION OF SEQUENCE OF OPERATIONS (SO#) PER ROOM TYPES. PROVIDE DEVICES TO SUPPORT THE SO#.
2. IN SPACES THAT DO NOT HAVE A SO# APPLIED, REFER TO PLANS AND SCHEDULES TO IDENTIFY CONTROLS APPLICATION. PROVIDE DEVICES TO SUPPORT THE APPLICATION.
3. WHERE INDICATED ON PLAN PROVIDE INTERFACE FOR CONNECTION TO MECHANICAL VAV BOXES. STATUS OF LIGHTING SHALL NOT AFFECT OPEN/CLOSE OF INTERFACE TO HVAC SYSTEM.
4. CONTROL EMERGENCY FED LIGHTING FIXTURES WITH NORMALLY FED FIXTURES. UTILIZE UL924 LISTED EMERGENCY CONTROL DEVICE(S) TO FORCE EMERGENCY FED LIGHTING TO 100% OUTPUT TO ACHIEVE EGRESS ILLUMINATION REQUIREMENTS. REFER TO PLANS FOR DESIGNATED EMERGENCY FED FIXTURES.
5. PROGRAM HIGH END TRIM OF EACH LIGHTING LOAD AT 80% OUTPUT AT THE ROOM / RELAY LEVEL. IDENTIFY IN PROGRAMMING MANUAL, ALL ZONES WITH HIGH END TRIM CAP AND METHOD FOR OWNER ADJUSTMENT AT FUTURE DATE.
6. BUILDING OPERATING HOURS ARE 5AM - 8PM, 7 DAYS PER WEEK.

### CONTROL STRATEGIES:

**SO#1**

1. LIGHTING IS MANUAL ON FROM DIGITAL WALL SWITCH/DIMMER(S). MANUAL CONTROL ALLOWS OCCUPANT ON/OFF, DIMMING, AND/OR SCENE PRESET CONTROL AS DESIGNED/SCHEDULED. AUTOMATIC SHUTOFF FROM VACANCY SENSORS AFTER 20 MINUTES OF NO ACTIVITY.

**SO#1D**

1. LIGHTING IS MANUAL ON FROM DIGITAL WALL SWITCH/DIMMER(S). MANUAL CONTROL ALLOWS OCCUPANT ON/OFF, DIMMING, AND/OR SCENE PRESET CONTROL AS DESIGNED/SCHEDULED. AUTOMATIC SHUTOFF FROM VACANCY SENSORS AFTER 20 MINUTES OF NO ACTIVITY.
2. UPON ACTIVATION OF LIGHTING (ON OR PRESET), AUTOMATIC DIMMING FROM DAYLIGHT SENSORS TAKES PRECEDENCE TO CONTROL FIXTURES IN DAYLIGHT ZONE. SENSORS PROVIDE CONTINUOUS DIMMING TO ACHIEVE DESIGNATED ILLUMINATION VALUES LISTED BELOW. DAYLIGHT SENSORS DO NOT TURN FIXTURES OFF WHEN LOW THRESHOLD IS REACHED. DAYLIGHT SENSOR ESTABLISHES HIGH TRIM, MANUAL DIMMING CAN CONTROL LIGHTS TO A LOWER DIMMED THRESHOLD OR OFF.
   - A. CORRIDORS: 15FC AT FLOOR PLANE
   - B. OFFICES, CLASSROOMS, RECEPTIONS DESKS, WAITING ROOMS: 30FC AT DESK HEIGHT.
   - C. EXAM ROOMS: 50-75FC AT TABLE.

## LIGHT FIXTURE SCHEDULE NOTES:

1. MANUFACTURERS, PRODUCTS, AND DESCRIPTIONS LISTED IN THE LIGHTING FIXTURE SCHEDULE ARE THE BASIS OF DESIGN SPECIFICATION FOR EACH FIXTURE TYPE. EQUAL PRODUCTS WILL BE ENTERTAINED UNLESS OTHERWISE NOTED. ALL PROPOSED EQUAL PRODUCTS ARE REQUIRED TO MEET OR EXCEED ALL OF THE SPECIFICATION REQUIREMENTS LISTED IN THE LIGHTING FIXTURE SCHEDULE INCLUDING BUT NOT LIMITED TO: PRODUCT GRADE, LIGHT SOURCE TECHNOLOGY, CONTROL TECHNOLOGY, OPTICAL PERFORMANCE (DELIVERED LUMENS OR CBCP), DISTRIBUTION, FIXTURE ACCESSORIES, CONSTRUCTION, DIMENSIONS, MOUNTING, FINISH, ENERGY PERFORMANCE, AND LISTINGS/RATINGS.

   THE SPECIFIER HAS EVALUATED ALL OF THE MANUFACTURERS LISTED BELOW AND CONSIDERS THESE MANUFACTURERS TO BE OF A QUALITY THAT MEET GENERAL SPECIFICATION REQUIREMENTS FOR THE CATEGORY OF PRODUCT UNDER WHICH THEY ARE LISTED. ALTHOUGH MANUFACTURERS ARE LISTED BELOW IT DOES NOT ENSURE THAT THEY HAVE PRODUCTS THAT MEET ALL OF THE SPECIFICATION REQUIREMENTS FOR EACH FIXTURE TYPE. IT MEANS THAT THESE MANUFACTURERS HAVE ALREADY BEEN EVALUATED AND HAVE PRODUCTS THAT SHALL BE REVIEWED FOR APPLICABILITY AS EQUALS. MANUFACTURERS THAT ARE NOT LISTED BELOW WILL REQUIRE A WORKING SAMPLE FOR SPECIFIER TO REVIEW IN ORDER TO BE EVALUATED FOR APPLICABILITY.

   THE BURDEN OF MEETING THE BASIS OF DESIGN SPECIFICATION IS ON THE DISTRIBUTOR QUOTING THE PROJECT. DETERMINATION OF EQUIVALENCY IS THE RESPONSIBILITY OF THE SPECIFIER. EVEN IF A PROPOSED EQUAL PRODUCT IS FROM ONE OF THE MANUFACTURERS LISTED BELOW, IF IT DOES NOT MEET THE BASIS OF DESIGN SPECIFICATION REQUIREMENTS THEN IT WILL BE REJECTED. THERE SHALL BE NO ADDITIONAL COST ASSOCIATED WITH REJECTION OF A FIXTURE NOT DEEMED EQUIVALENT BY THE SPECIFIER.

   A. ARCHITECTURAL GRADE TROFFERS: AXIS, FOCAL POINT, LEDALITE, LITECONTROL
   B. SPECIFICATION GRADE TROFFERS: CORONET, FINELITE, MARK ARCHITECTURAL LIGHTING, PRUDENTIAL
   C. COMMERCIAL TROFFERS AND WHITEGOODS: COLUMBIA, CREE, DAYBRITE, DAY-O-LITE, GE CURRENT, HE WILLIAMS, LITHONIA, METALUX, MERCURY, PMC
   D. ARCHITECTURAL GRADE DOWNLIGHTS / TRACK: EDISON PRICE, GOTHAM INCITO, IGUZZINI, INTENSE GRAVITY, KURT VERSEN, LEDRA ALPHABET NU PRO, LUCIFER, LUMENPULSE, PRESCOLITE LITEISTRY, TECH ELEMENT, USA ILLUMINATION(COMPLETE)
   E. SPECIFICATION GRADE DOWNLIGHTS / TRACK: 3G, BRUCK, CON-TECH, FOCAL POINT, GOTHAM EVO, HE WILLIAMS, INTENSE MX, JUNO-INDY, LEDRA ALPHABET NU ESSENTIALS, LIGHTOLIER (CALCULITE), NORA, PORTFOLIO, PRESCOLITE, SPECTRUM, TECH ELEMENT PRO, USA ILLUMINATION (BASIC)
   F. COMMERCIAL GRADE DOWNLIGHTS / TRACK: CONTRAST, CREE, DMF, GE CURRENT, HALO COMMERCIAL, JUNO, INTERLUX, LIGHTHEADED, LIGHTOLIER (LYTEPROFILE), LITON, LITHONIA, PEACHTREE, PRESCOLITE LITEFRAME COMMERCIAL, TECH ENTRA, USA ILLUMINATION(PRIMARY), VANTAGE
   G. MICROCELL DOWNLIGHTS: 3G, ALPHABET, ARTEMIDE, IGUZZINI, LED LINEAR, MODULAR LIGHTING, USA ILLUMINATION
   H. SPECIFICATION LINEAR CUSTOM CONFIGURATIONS: ALIGHT, CORONET, FINELITE, FOCAL POINT, GAMMALUX, LUMENWERX
   I. SPECIFICATION LINEAR: A-LIGHT, ARCHITECTURAL LIGHTING WORKS, AXIS, CORONET, FINELITE, FOCAL POINT, GAMMALUX, HE WILLIAMS, LEDALITE, LITECONTROL, LUMENWERX, LUMINII, LUMIUM, MARK ARCHITECTURAL LIGHTING, MERCURY, NEORAY, PEERLESS, PRUDENTIAL, STARTEK, XAL
   J. COMMERCIAL GRADE LINEAR: CORELITE, DAY-O-LIGHT, LUMAX, NULITE, PMC
   K. EXIT AND EMERGENCY: BIG BEAM, CHLORIDE, DUAL-LITE, EMERGI-LITE, EVENLITE, HE WILLIAMS, ISOLITE, LITHONIA, MULE, SURE-LITES, UTOPIA
2. PROVIDE WITH CONTINUOUS ILLUMINATION ENTIRE LENGTH OF FIXTURE. FASTEN LENSING SO THAT AT NO POINT ARE LED NODES VISIBLE. FIXTURE TO ACCOMODATE LENGTHS TO 1/8" TOLERANCE. SHIP FIXTURES, IN ALL LENGTHS UP TO 8FEET LONG, AS A SINGLE EXTRUDED ALUMINIUM HOUSING WITH SINGLE LENS. INCLUDE PHYSICAL DEMONSTRATION OF MANUFACTURER'S FIELD JOINING PROCESS, FIT AND FINISH FOR FINAL APPROVAL, AS REQUESTED DURING PRIOR APPROVAL AND/OR SUBMITTAL PROCESS .
3. PROVIDE A WIDESPREAD BATWING DISTRIBUTION FOR INDIRECT DISTRIBUTION OF FIXTURE.
4. FORMAL FACTORY DRAWINGS ARE REQUIRED DURING SHOP DRAWING SUBMITTAL PROCESS. FACTORY DRAWINGS TO INCLUDE, BUT NOT LIMITED TO, OVERALL LAYOUT REPRESENTING LENGTHS, CONNECTIONS, MOUNTING HARDWARE, ETC. FOR EACH LENGTH AND CONFIGURATION OF TYPE. FINAL PRODUCT APPROVAL MAY BE CONTINGENT ON A/E REVIEW OF ASSOCIATED ARCHITECTRAL MATERIALS AND APPROVED ARCHITECTURAL PRODUCT SUBMITTALS, I.E. SPECIALTY CASEWORK OR CEILING DRAWINGS. THIS PRODUCT INTEGRATION PROCESS MAY ADD TO OVERALL PRODUCT REVIEW TIME.
5. PROVIDE DRIVER(S) TO CONTROL DIRECT AND INDIRECT DISTRIBUTIONS SEPARATELY.
6. WHERE CONTINUOUS FIXTURE IS SHOWN ON PLANS TO HAVE 4' SEGMENT(S) WIRED TO LIFE SAFETY CIRCUIT AND THE REMAINDER OF THE FIXTURE WIRED TO NORMAL CIRCUIT, PROVIDE WITH 2-CIRCUIT FEED: ONE FOR LIFE SAFETY CIRCUIT, ONE FOR NORMAL CIRCUIT. DEDICATE LIFE SAFETY CIRCUIT TO DIRECT DISTRIBUTION OF FIXTURE. CONSTRUCT FIXTURE SUCH THAT NORMAL AND LIFE SAFETY WIRING INSIDE FIXTURE ARE PHYSICALLY SEGREGATED WITHIN THE LUMINAIRE IN ACCORANCE WITH NEC 700. SEGMENT OF FIXTURE WIRED TO EMERGENCY WILL BE CONTROLLED VIA UL924 EMERGENCY CONTROL DEVICE. SEE PLANS FOR FURTHER INFORMATION.

## DISTRIBUTED IN-ROOM CONTROL SCHEDULE

| LOCATION | ZONE DESIGNATION | CIRCUIT CONTROLLED | LOAD DESCRIPTION | BRANCH SOURCE | VOLTAGE | CONTROL TYPE | CONTROL: LOW VOLTAGE SWITCH | CONTROL: OCCUPANCY / VACANCY SENSOR | CONTROL: DAYLIGHT SENSOR | CONTROL: TIMECLOCK | SEQUENCE OF OPERATIONS | SEE NOTE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ELECTRICAL 101 | D-1 | SEE NOTE | KITCHEN TROFFERS | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-2 | SEE NOTE | KITCHEN TROFFERS DAYLIGHT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | DIM | SWEEP OFF | SO#1D | |
| | D-3 | SEE NOTE | KITCHEN DOWNLIGHTS | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-4 | SEE NOTE | FIREFLY DOWNLIGHTS DAYLIGHT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | DIM | SWEEP OFF | SO#1D | |
| | D-5 | SEE NOTE | FIREFLY SOUTH PENDANTS | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-6 | SEE NOTE | FIREFLY DOWNLIGHTS | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | 1 |
| | D-7 | SEE NOTE | FIREFLY NORTH PENDANTS | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-8 | SEE NOTE | FIREFLY TRACK | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-9 | SEE NOTE | TOSA ROOM WEST PERIMETER INDIRECT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-10 | SEE NOTE | TOSA ROOM WEST PERIMETER DIRECT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-11 | SEE NOTE | TOSA ROOM WEST INDIRECT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-12 | SEE NOTE | TOSA ROOM WEST DIRECT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | 1 |
| | D-13 | SEE NOTE | TOSA ROOM CENTER INDIRECT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-14 | SEE NOTE | TOSA ROOM CENTER DIRECT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-15 | SEE NOTE | TOSA ROOM EAST INDIRECT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-16 | SEE NOTE | TOSA ROOM EAST DIRECT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | 1 |
| | D-17 | SEE NOTE | TOSA ROOM EAST PERIMETER INDIRECT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-18 | SEE NOTE | TOSA ROOM PERIMETER DIRECT | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-19 | SEE NOTE | RIVER ROOM SOUTH LINEARS | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | DIM | SWEEP OFF | SO#1D | 1 |
| | D-20 | SEE NOTE | RIVER ROOM CENTER LINEARS | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | - | SWEEP OFF | SO#1 | |
| | D-21 | SEE NOTE | RIVER ROOM NORTH LINEARS | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | DIM | SWEEP OFF | SO#1D | 1 |
| | D-22 | SEE NOTE | RIVER ROOM BAR LINEARS | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | DIM | SWEEP OFF | SO#1D | |
| | D-23 | SEE NOTE | RIVER ROOM RESTROOM ALCOVE | N | 120 | 0-10V | ON / OFF / PRESET | MANUAL ON/ AUTO OFF | DIM | SWEEP OFF | SO#1D | |

BRANCH SOURCES: N = NORMAL E1 = 517 LIFE SAFETY E2 = 700 EMERGENCY C = 517 CRITICAL CARE Q = 517 EQUIPMENT S1 = 701 LEGALLY REQUIRED STANDBY S2 = 702 OPTIONAL STANDBY

## DISTRIBUTED IN-ROOM GENERAL NOTES:

1. PROVIDE ALL NECESSARY COMPONENTS FOR A COMPLETE AND OPERATING SYSTEM.
2. PROVIDE ADDITIONAL CONTROLLERS AS NECESSARY TO SEPARATE VOLTAGES AND BRANCH SOURCES AND ACCOMMODATE ALL CONTROL ZONES.
3. INSTALL CONTROLLERS FOR EACH IN-ROOM SYSTEM ARE INTENDED ABOVE ROOMS ACCESSIBLE CEILING ABOVE DOOR ENTRY, OR IN NEAREST ACCESSIBLE LOCATION. INDICATE LOCATION OF CONTROLLERS ON RECORD DRAWINGS.
4. VERIFY ALL PROGRAMMING PARAMETERS WITH OWNER PRIOR TO FINAL COMMISSIONING.
5. REFER TO DISTRIBUTED LOW VOLTAGE SWITCH STATION SCHEDULE AND SEQUENCE OF OPERATIONS SCHEDULE FOR MORE INFORMATION.

## DISTRIBUTED IN-ROOM CONTROL SCHEDULE NOTES:

1. EGRESS FIXTURES SHOWN ON PLAN, FED BY RELAY, UTLIZE A UL924 LISTED DEVICE. REFER TO DETAILS ON E520 FOR WIRING DIAGRAM. EC TO VERIFY COMPATIBLE TYPE(S).

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
ELECTRICAL SCHEDULES

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

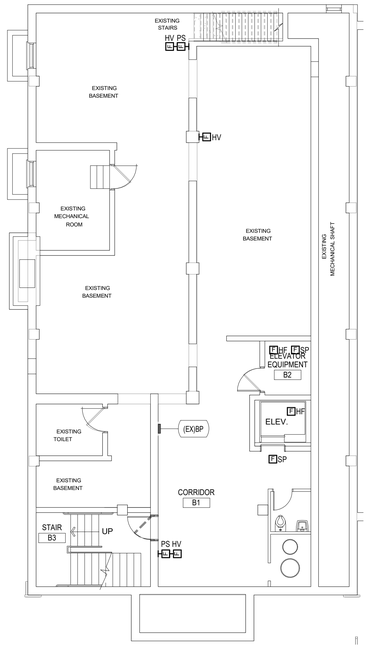
790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
E603

12/21/2023 1:52:53 PM

Kahler Slater

RING & DUCHATEAU CONSULTING ENGINEERS
17400 West Capitol Drive - Brookfield, WI 53045
301 South Blount Street, Suite 101 - Madison, WI 53703
Phone: 414.778.1700 | Fax: 414.778.2360 | r-d@ringdu.com
RD Project Number: 223003.00




3 BASEMENT ELECTRICAL DEMOLITION PLAN
1/8" = 1'-0"

## SHEET NOTES

A. ALL ELECTRICAL EQUIPMENT SHOWN ON THE DEMOLITION PLANS ARE "EXISTING TO BE REMOVED" UNLESS OTHERWISE INDICATED. IN ADDITION TO REMOVING DEVICES, REMOVE ALL ASSOCIATED ELECTRICAL CIRCUITS, CONDUITS AND CONDUCTORS, BACK TO SOURCE. REFER TO THE SPECIFICATIONS FOR ELECTRICAL DEMOLITION REQUIREMENTS. EMILY ADD: THIS SCOPE OF WORK INCLUDES COMMUNICATIONS AND OTHER LOW VOLTAGE CABLINE INDICATED ON DEMOLITION PLANS.

B. EXISTING TO REMAIN "EX" REFERS TO THE STATUS OF BASIC ELECTRICAL DEVICES. THERE MAY BE SOME WORK REQUIRED IN THESE SPACES INVOLVING BACK-FEEDING EXISTING CIRCUITS OR OTHER MODIFICATIONS. SEE ALL DOCUMENTS THAT MAKE UP THIS CONTRACT FOR THE TOTAL EXTENT OF WORK REQUIRED IN ALL SPACES.

C. ALL INFORMATION SHOWN ON THE PLANS WAS GATHERED FROM FIELD OBSERVATION AND EXISTING DRAWINGS. FIELD VERIFY EXISTING CONDITIONS AND PROVIDE ADDITIONAL TRACING, REMOVING, RELOCATING AND EXTENDING OF CIRCUITS AND DEVICES NECESSARY TO MAINTAIN CONTINUITY OF EXISTING EQUIPMENT NOT IN THE AREA OF WORK. FIELD VERIFY EXACT DEMOLITION REQUIREMENTS AND INCLUDE ALL ASSOCIATED COSTS. ALL ABANDONED WIRING, CONDUITS, FITTINGS, BOXES, SUPPORTS, ETC. TO BE REMOVED FROM THE DEVICES BACK TO THE RESPECTIVE SOURCE PANEL. PROVIDE REVISED TYPED CIRCUIT DIRECTORY IN PANELBOARDS THAT HAVE CIRCUITS REMOVED. REFER TO THE SPECIFICATIONS FOR ADDITIONAL ELECTRICAL DEMOLITION REQUIREMENTS.

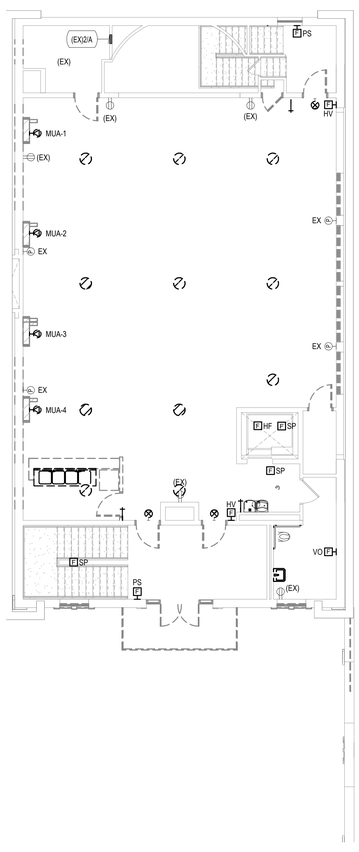
D. DASHED WALLS ON THE DEMOLITION PLANS INDICATE, IN GENERAL, EXISTING WALLS BEING DEMOLISHED. DO NOT RELY ON ELECTRICAL DRAWINGS TO DETERMINE EXTENT OF GENERAL CONSTRUCTION DEMOLITION. REFER TO ARCHITECTURAL DEMOLITION PLANS FOR THE EXACT EXTENT OF GENERAL CONSTRUCTION DEMOLITION REQUIRED BY THIS CONTRACT.

E. REFER TO DEMOLITION DRAWINGS OF OTHER TRADES. WHERE MOTORS, CONTROL PANELS, AND OTHER LOADS THAT HAVE AN ELECTRICAL CONNECTION ARE BEING REMOVED, INCLUDE THE DISCONNECTION AND REMOVAL OF ASSOCIATED ELECTRICAL FEEDS, CIRCUITS, AND LOOSE CONTROL EQUIPMENT IN THIS CONTRACT.

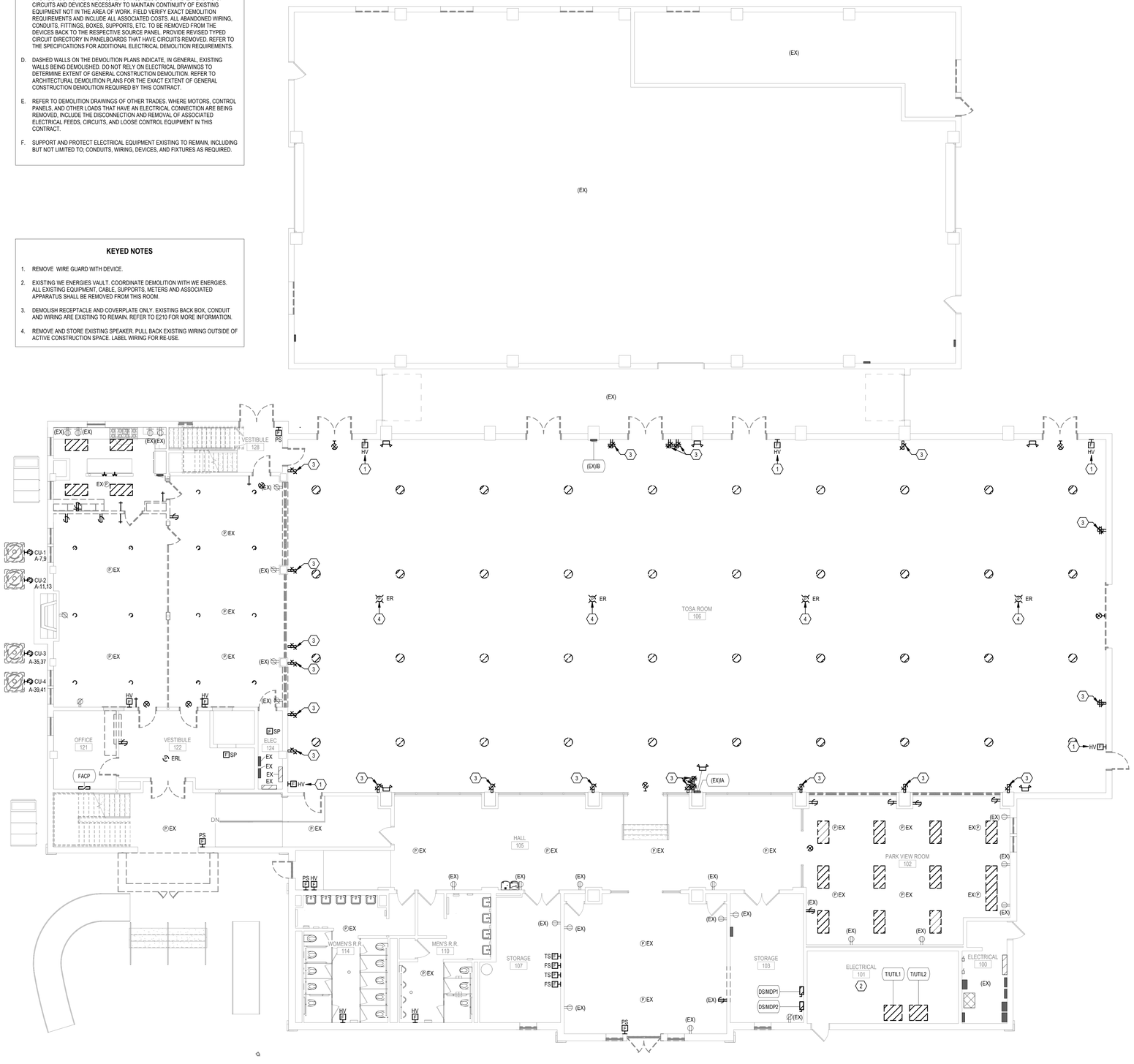
F. SUPPORT AND PROTECT ELECTRICAL EQUIPMENT EXISTING TO REMAIN, INCLUDING BUT NOT LIMITED TO; CONDUITS, WIRING, DEVICES, AND FIXTURES AS REQUIRED.

## KEYED NOTES

1. REMOVE WIRE GUARD WITH DEVICE.
2. EXISTING WE ENERGIES VAULT. COORDINATE DEMOLITION WITH WE ENERGIES. ALL EXISTING EQUIPMENT, CABLE, SUPPORTS, METERS AND ASSOCIATED APPARATUS SHALL BE REMOVED FROM THIS ROOM.
3. DEMOLISH RECEPTACLE AND COVERPLATE ONLY. EXISTING BACK BOX, CONDUIT AND WIRING ARE EXISTING TO REMAIN. REFER TO E210 FOR MORE INFORMATION.
4. REMOVE AND STORE EXISTING SPEAKER. PULL BACK EXISTING WIRING OUTSIDE OF ACTIVE CONSTRUCTION SPACE. LABEL WIRING FOR RE-USE.




2 SECOND FLOOR ELECTRICAL DEMOLITION PLAN
1/8" = 1'-0"




1 FIRST FLOOR ELECTRICAL DEMOLITION PLAN
1/8" = 1'-0"

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

# MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
ELECTRICAL DEMOLITION PLANS

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
ED200

12/21/2023 1:52:53 PM

# LEGEND

| | EXISTING | PROPOSED |
|---|---|---|
| CENTER LINE | | |
| SPOT ELEVATIONS | 910.3 | × 910.3 |
| FLOW ARROW | | |
| BURIED / COVERED | | |
| FENCE | X | X |
| RISER | | |
| EXISTING MATERIALS TO BE REMOVED | | |
| SECTION | | ICE 105 |
| OIL COOLER LINE | OCL | OCL |
| OIL RETURN LINE | ORL | ORL |
| HIGH PRESSURE LIQUID REFRIGERANT | | |
| LOW PRESSURE LIQUID REFRIGERANT | | |
| HIGH PRESSURE GAS/VAPOR REFRIGERANT | | |
| LOW PRESSURE GAS/VAPOR REFRIGERANT | | |
| EQUALIZATION LINE | EL | EL |
| VENT LINE | ATV | ATV |
| BRINE SUPPLY | BS | BS |
| BRINE RETURN | BR | BR |
| GLYCOL SUPPLY | GS | GS |
| GLYCOL RETURN | GR | GR |
| CONDENSER WATER SUPPLY | CS | CS |
| CONDENSER WATER RETURN | CR | CR |
| COLD WATER SUPPLY | CWS | CWS |
| COLD WATER RETURN | CWR | CWR |
| HOT/COLD WATER SUPPLY | HCS | HCS |
| HOT/COLD WATER RETURN | HCR | HCR |
| FILL LINE | FILL | FILL |
| DRAIN | D | D |
| GAS | G | G |
| SANITARY SEWER BELOW FLOOR | SS | SS |

| | |
|---|---|
| KEYNOTE | 1 |
| CONTINUATION - SAME SHEET | 1 |
| CONTINUATION - SEPARATE SHEET | 1 |

# EQUIPMENT TAGS

P2

| | | | |
|---|---|---|---|
| B | BOILER | P | PUMP |
| C | COMPRESSOR | PU | PUMPER DRUM |
| CP | CHEMICAL FEED PUMP | SP | SUMP PUMP |
| CU | CONDENSING UNIT | T | TANK |
| EH | ELECTRIC UNIT HEATER | V | VESSEL |
| EF | EXHAUST FAN | WH | WATER HEATER |
| H | HEAT EXCHANGER | WS | WATER SOFTNER |
| L | LOUVER | | |

**NOTE: NOT ALL SYMBOLS, ABBREVIATIONS OR LINETYPES SHOWN ON THIS SHEET ARE USED IN THIS SET OF DRAWINGS.**

# SYMBOLS

AIR LINE
AIR SEPARATOR (INLINE)
AIR VENT, MANUAL
AUTOMATIC VENT
BALL VALVE
BUCKET TRAP
BUTTERFLY VALVE
CHECK VALVE
COMBINATION BALANCE AND FLOW MEASURING VALVE
CHECK , SPRING VALVE
CONT. NOTE (SAME SHEET)
CONT. NOTE (SEPERATE SHEET)
CONTROL SYSTEM NOTE
EQUIPMENT TAG
BACK PRESSURE REGULATING VALVE
EXPANSION VALVE, HAND
EXPANSION VALVE, AUTOMATIC
EXPANSION VALVE, THERMOSTATIC
FILTER AND DRIER
FLANGE
FLEXIBLE CONNECTOR
FLOAT SWITCH
FLOAT SWITCH (PILOT TYPE)
FLOAT VALVE, HIGH SIDE
FLOAT VALVE, LOW SIDE
FLOW ARROW
FLOW CONTROL VALVE
FLOW SWITCH
GAS DETECTOR
GATE VALVE
GLOBE VALVE W/ SEAL CAP
GLOBE VALVE W/ SEAL CAP, ANGLE
LEVEL EYE
LIQUID DRAINER
LONG RADIUS ELBOW
NEEDLE VALVE
OIL SEPARATOR
PITCH OF PIPE, RISE (R) DROP (D)
PRESSURE GAGE AND COCK
PRESSURE REGULATING VALVE
PRESSURE SWITCH
REDUCER
RELIEF VALVE
REVISION NOTE
RUPTURE DISK
SHORT RADIUS ELBOW
SIGHT GLASS (IN-LINE)
SIGHT GLASS (EXTERNAL)
SOLENOID VALVE
STRAINER (BRINE/GLYCOL)
STRAINER (REFRIGERANT)
SUCTION DIFFUSER
THREE-WAY VALVE
THERMAL BULB
THERMOMETER
THERMOMETER WELL, ONLY
THERMOSTAT, ELECTRIC
THERMOSTAT, SELF-CONTAINED
THERMOSTAT, REMOTE BULB
TRIPLE DUTY VALVE
UNION
VIBRATION ABSORBER
WATER METER

# ABBREVIATIONS

| | | | |
|---|---|---|---|
| ALT | ALTERNATE | INV | INVERT |
| AMP | AMPERE | KW | KILOWATT |
| APPROX | APPROXIMATE | KWH | KILOWATT HOUR |
| ARCH | ARCHITECT / ARCHITECTURAL | LBS | POUNDS |
| BHP | BREAK HORSEPOWER | LF | LINEAR FEET |
| BLDG | BUILDING | MAX | MAXIMUM |
| BTU | BRITISH THERMAL UNIT | MBH | THOUSAND BTU'S/HOUR |
| C | CELSIUS | MCC | MOTOR CONTROL CENTER |
| CFM | CUBIC FEET PER MINUTE | MIL | MIL |
| CO | CLEANOUT | MIN | MINIMUM |
| CONN | CONNECTION | MECH | MECHANICAL |
| CW | COLD WATER | NA | NOT APPLICABLE |
| DEMO | DEMOLITION | NC | NORMALLY CLOSED |
| DIA | DIAMETER | NO | NORMALLY OPEN |
| DWG | DRAWING | NTS | NOT TO SCALE |
| DX | DIRECT EXPANSION | OC | ON CENTER |
| EA | EACH | OD | OUTSIDE DIAMETER |
| ELEC | ELECTRIC | PH | PHASE (ELECTRIC) |
| ELEV | ELEVATION | POLY | POLYETHYLENE PIPE |
| EQUIP | EQUIPMENT | PSI | POUNDS PER SQUARE INCH |
| EX | EXISTING | PVC | POLYVINYL PIPE |
| EXH | EXHAUST EXPANSION | REBAR | REINFORCEMENT |
| F | FAHRENHEIT | REQ'D | REQUIRED |
| FD | FLOOR DRAIN | RH | RELATIVE HUMIDITY |
| FFE | FINISHED FLOOR ELEVATION | RM | ROOM |
| FT | FOOT OR FEET | RPM | REVOLUTIONS PER MINUTE |
| GAL | GALLONS | SF | SQUARE FEET |
| GPM | GALLONS PER MINUTE | SPEC | SPECIFICATION |
| HDR | HEADER | SS | STAINLESS STEEL |
| HDPE | HIGH DENSITY POLYETHYLENE | STD | STANDARD |
| HT | HEIGHT | TEMO | TEMPERATURE |
| HR | HOURS | TP | TEMPERATURE |
| HP | HORSEPOWER | TYP | TYPICAL |
| HVAC | HEATING, VENTING, AIR CONDITIONING | V | VOLTS |
| HX | HEAT EXCHANGER | VFD | VARIABLE FREQUENCY DRIVE |
| HZ | HERTZ | W/ | WITH |
| ID | INSIDE DIAMETER | W/O | WITHOUT |


Kahler Slater
B32° Engineering Group
2211 O' Neil Road - Hudson, WI 54016
Phone: (651) 256-3090
www.B32eng.com


Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No. 223010.00
CITY OF WAUWATOSA

Sheet Title
CURLING RINK LEGEND AND SYMBOLS

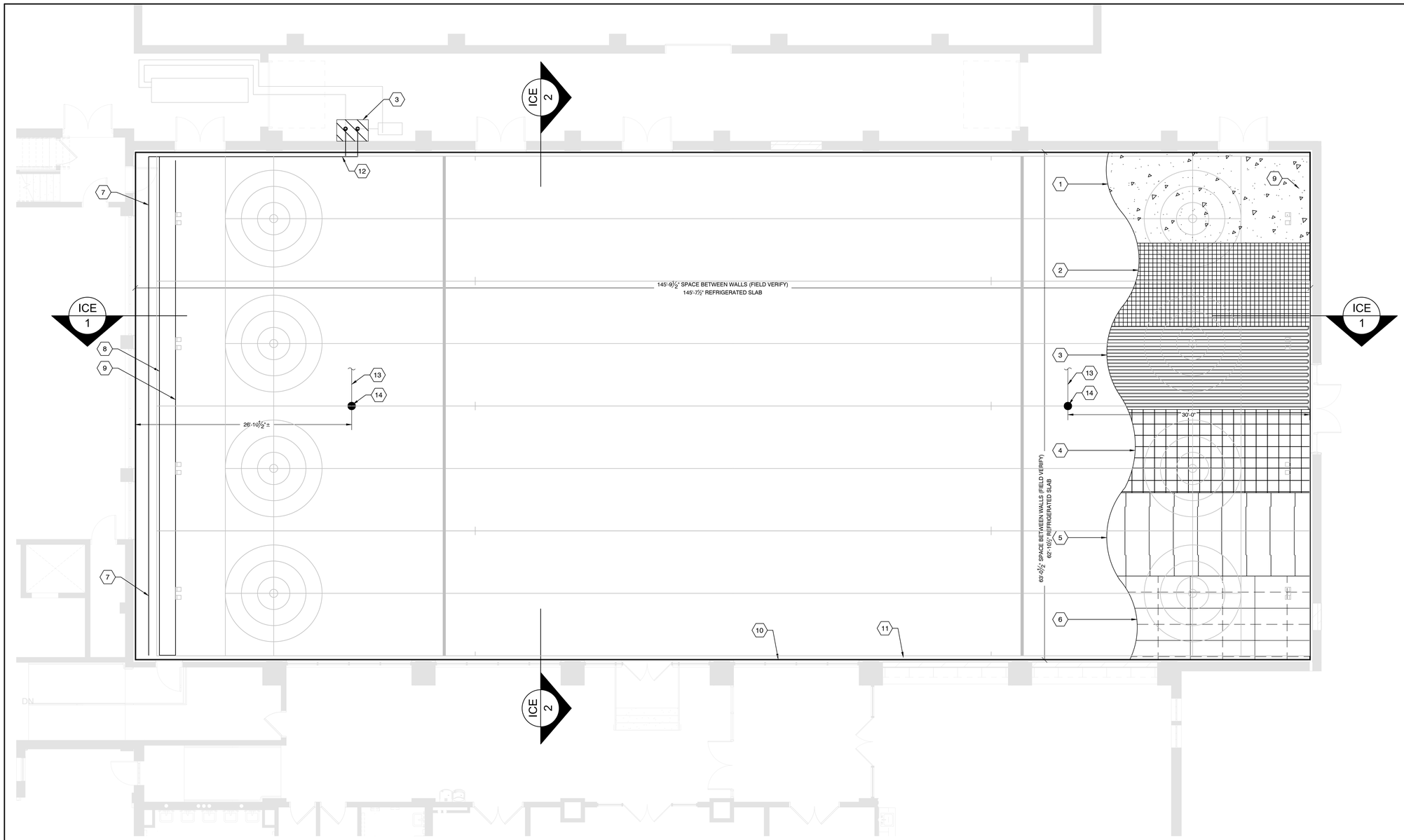
NORTH


Copyright © 2020 Kahler Slater, Inc. All rights reserved.



790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001


Sheet No.
R001




1 CURLING RINK FLOOR PLAN
SCALE: 3/16" = 1'-0"

| GENERAL NOTES: | KEY NOTES: | | |
|---|---|---|---|
| 1. FIELD VERIFY ALL DIMENSIONS.<br>2. PIPING SHOWN IN SCHEMATIC FORM. | 1. CONCRETE: 5" THICK<br>2. WIRE MESH: 6" X 6" X W2.1 X W2.1. 6" MINIMUM OVERLAP BETWEEN SHEETS. TIE TO REBAR EVERY 24". TERMINATE 2" FROM RINK EDGE.<br>3. RINK PIPING: 1" POLYETHYLENE PIPE @ 4" O.C. FUSION WELDED CONNECTIONS.<br>4. REINFORCEMENT: #4 BARS @ 12" O.C. PARALLEL WITH RINK PIPING AND 12" O.C. PERPENDICULAR WITH RINK PIPING. MINIMUM LAP OF 25".<br>5. PIPE AND REBAR SUPPORT CHAIRS @ 3'-0" O.C. THE ENTIRE LENGTH OF THE RINK. CHAIR SPACING SHALL BE 2'-0" O.C. IF MOTORIZED EQUIPMENT WILL BE DRIVEN ON RINK PIPING FOR CONCRETE PLACEMENT OR SCREEDING. SUPPORT CHAIR SECTIONS SHALL OVERLAP A MINIMUM OF TWO RINK PIPES.<br>6. FLOOR INSULATION: TWO (2) LAYERS OF EXTRUDED POLYSTYRENE 2" THICK, 4'-0" X 8'-0" SHEETS, 25 PSI - STAGGER JOINTS. FINISHED INSULATION THICKNESS SHALL BE 4". COVER INSULATION WITH VAPOR BARRIER. | 7. 6" SDR 11 POLYETHYLENE SUPPLY HEADER. FUSION WELDED CONNECTIONS.<br>8. 6" SDR 11 POLYETHYLENE RETURN HEADER. FUSION WELDED CONNECTIONS.<br>9. 6" SDR 11 POLYETHYLENE REVERSE RETURN HEADER. FUSION WELDED CONNECTIONS.<br>10. EXPANSION JOINT AROUND ENTIRE PERIMETER OF RINK FLOOR. SEE DETAIL ICE-81<br>11. 1" POLYETHYLENE PERIMETER PIPE AROUND ENTIRE PERIMETER OF RINK FLOOR.<br>12. 6" BURIED INSULATED SDR 17 POLYETHYLENE TRANSMISSION MAINS TO/FROM ICE REFRIGERATION ROOM. CONNECT TO EXISTING STEEL PIPING IN ICE REFRIGERATION ROOM.<br>13. 3/4" RIGID PVC CONDUIT AND CABLES. ROUTE CONDUIT FROM SENSOR DIRECTLY TO ICE EQUIPMENT ROOM.<br>14. ICE AND SUB-FLOOR TEMPERATURE SENSOR, BOX AND CONDUIT. SEE DETAIL ICE-83. | 15. NEW CONCRETE INFILL SLAB WHERE EXISTING SLAB WAS REMOVED. SEE DETAIL ICE-32 |

Kahler Slate
B32° Engineering Group
2211 O' Neil Road - Hudson, WI 54016
Phone: (651) 256-3090
www.B32eng.com

Revisions

CONSTRUCTION DOCUMENT

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No. 223010.00
CITY OF WAUWATOSA

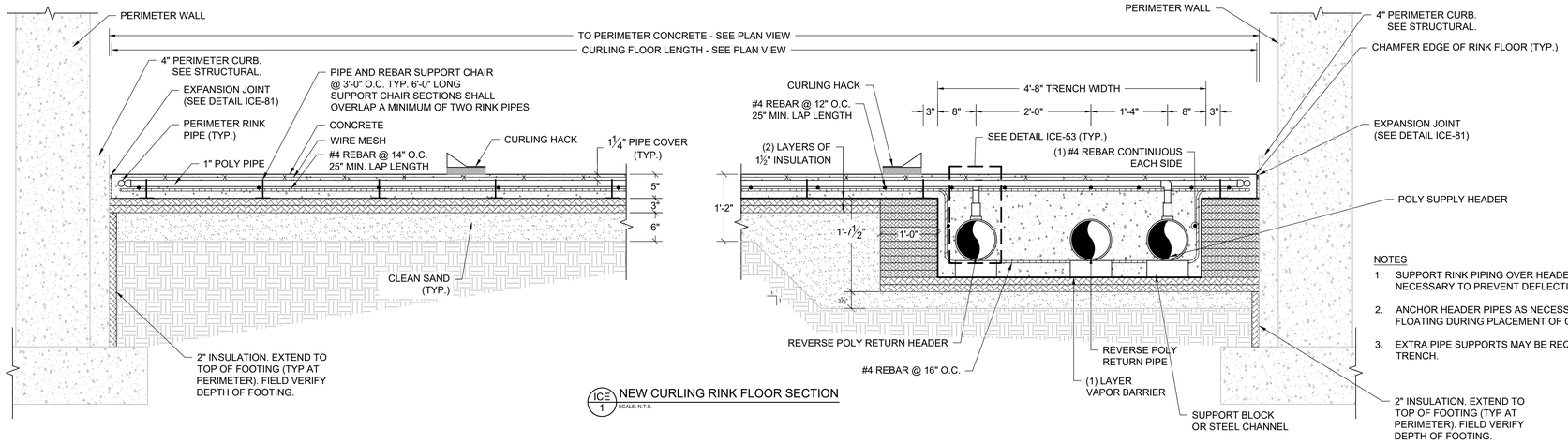
Sheet Title
CURLING RINK FLOO PLAN

NORTH

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 5320
Telephone 414.272.2000 Fax 414.272.2001

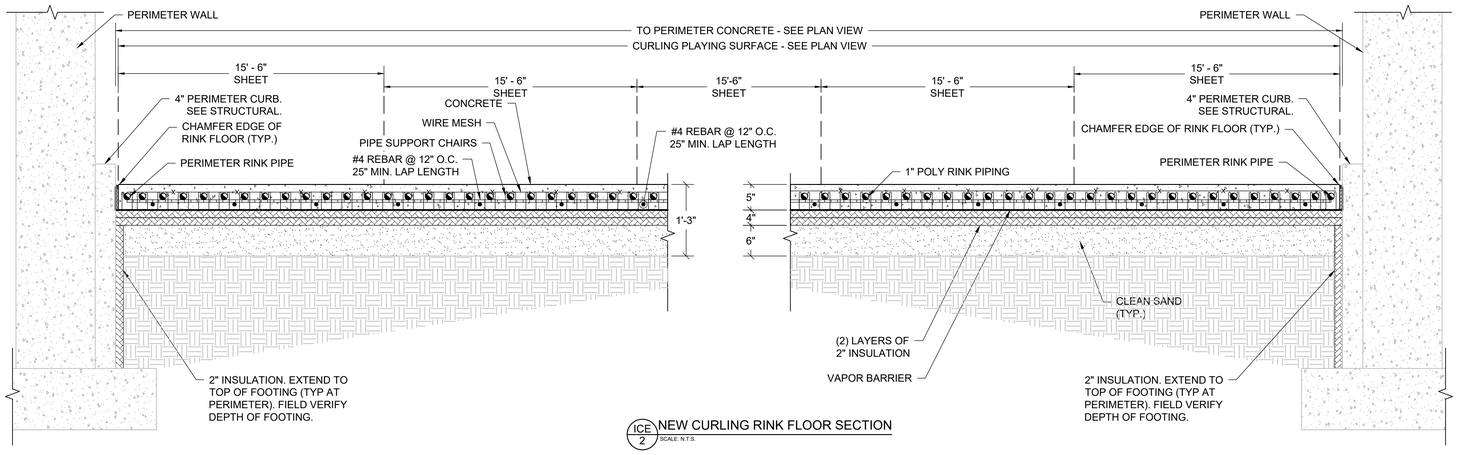
Sheet No.
R100



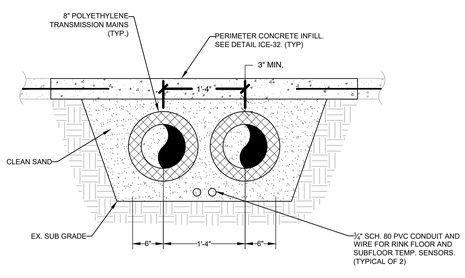

ICE 1 NEW CURLING RINK FLOOR SECTION
SCALE: N.T.S.

NOTES

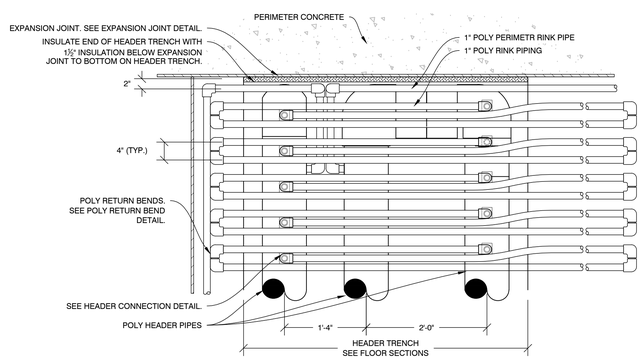
1. SUPPORT RINK PIPING OVER HEADER TRENCH AS NECESSARY TO PREVENT DEFLECTION.
2. ANCHOR HEADER PIPES AS NECESSARY TO PREVENT FLOATING DURING PLACEMENT OF CONCRETE.
3. EXTRA PIPE SUPPORTS MAY BE REQUIRED OVER HEADER TRENCH.



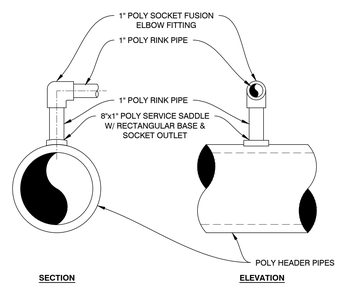

ICE 2 NEW CURLING RINK FLOOR SECTION
SCALE: N.T.S.



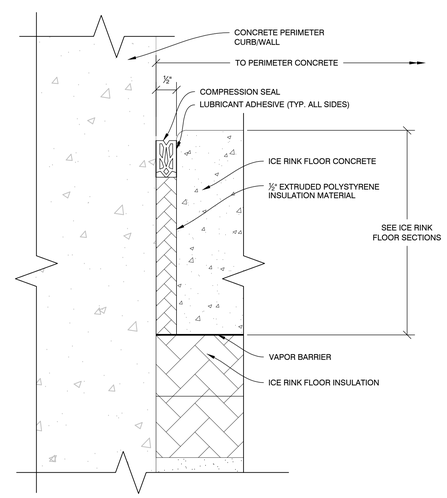

ICE 3 TYPICAL TRENCH SECTION
SCALE: N.T.S.




ICE 49 ICE RINK HEADER PIPE DETAIL
SCALE: N.T.S.




ICE 52 ICE RINK HEADER PIPE CONNECTION DETAIL
SCALE: N.T.S.




**NOTE:**
1. EXPANSION JOINT SYSTEM SHALL BE INSTALLED PER MANUFACTURERS RECOMMENDATIONS.
2. CONTRACTOR SHALL FIELD VERIFY WIDTH OF JOINT PRIOR TO ORDERING MATERIALS.

ICE 81 ICE RINK EXPANSION JOINT DETAIL (INDOOR)
SCALE: N.T.S.


Kahler Slater
B32° Engineering Group
2211 O' Neil Road - Hudson, WI 54016
Phone: (651) 256-3090
www.B32eng.com


Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No. 223010.00
CITY OF WAUWATOSA

Sheet Title
CURLING RINK DETAILS

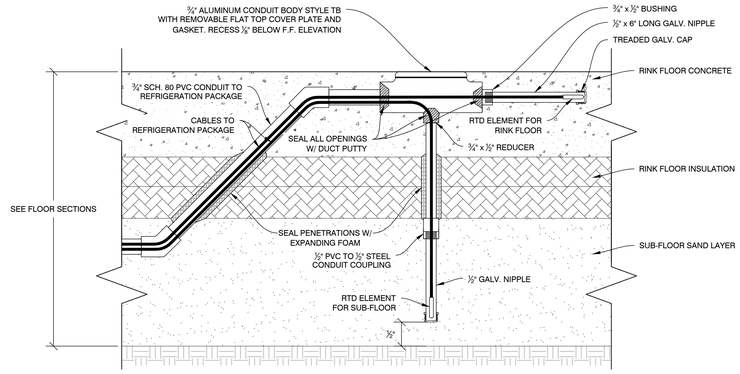
NORTH


Copyright © 2020 Kahler Slater, Inc. All rights reserved.

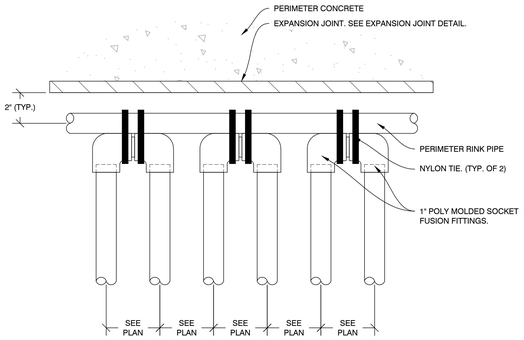


790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

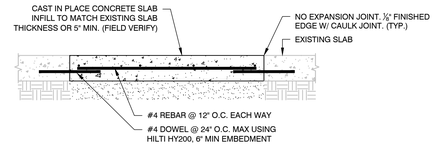

Sheet No.
R500




ICE 83 ICE RINK TEMPERATURE SENSOR DETAIL
SCALE: N.T.S.




ICE 76 ICE RINK PIPING DETAIL
SCALE: N.T.S.




**TYPICAL @ SLAB INFILL**

ICE 32 TYPICAL CONCRETE SLAB INFILL DETAIL
SCALE: N.T.S.

| EXPOSED ITEM | TYPE | THICKNESS | JACKET TYPE | JACKET COLOR |
|---|---|---|---|---|
| PIPE UP TO 1 1/4" DIA. | 5 | 1 1/2" | 2 | WHITE |
| PIPE 1 1/2" TO 4" DIA. COLD BRINE, GLYCOL AND REF. | 5 | 2" | 2 | WHITE |
| PIPE 1 1/2" TO 4" DIA. WARM BRINE, GLYCOL | 5 | 2" | 2 | RED |
| PIPE 5" TO 8" DIA. COLD BRINE, GLYCOL | 5 | 3" | 2 | WHITE |
| PIPE 10" AND UP DIA. COLD BRINE, GLYCOL | 5 | 3" | 2 | WHITE |
| VALVES (WHERE PIPE IS INSULATED) | 5 | SAME AS PIPE | 2 | WHITE |
| RINK PUMPS | 3 | 2" | NONE | - |
| CHILLER AND SURGE DRUM | 5 | 3" | 2 | WHITE |
| WASTE HEAT EXCHANGERS | 5 | 2" | 2 | RED |
| | | | | |
| | | | | |
| BURIED ITEM | | | | |
| SNOW MELT PIT SYSTEM PIPING (INTERIOR) | 5 | 2" | 3 | WHITE |
| SNOW MELT PIT SYSTEM PIPING (EXTERIOR) | 5A | 2" | SEE SPEC | SEE SPEC |
| SUB-FLOOR HEAT SYSTEM PIPING | NONE | - | NONE | - |
| BRINE/GLYCOL PIPING TO/FROM RINK FLOOR | 5A | 2 1/2" | SEE SPEC | SEE SPEC |

REMARKS:
CHECK SPECIFICATIONS FOR REQUIRED COATING ON BURIED STEEL, NON-INSULATED PIPE.

ICE 163 INSULATION SCHEDULE
SCALE: N.T.S.

Kahler Slater
B32°
Engineering Group
2211 O' Neil Road - Hudson, WI 54016
Phone: (651) 256-3090
www.B32eng.com

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

Sheet Title
CURLING RINK DETAILS

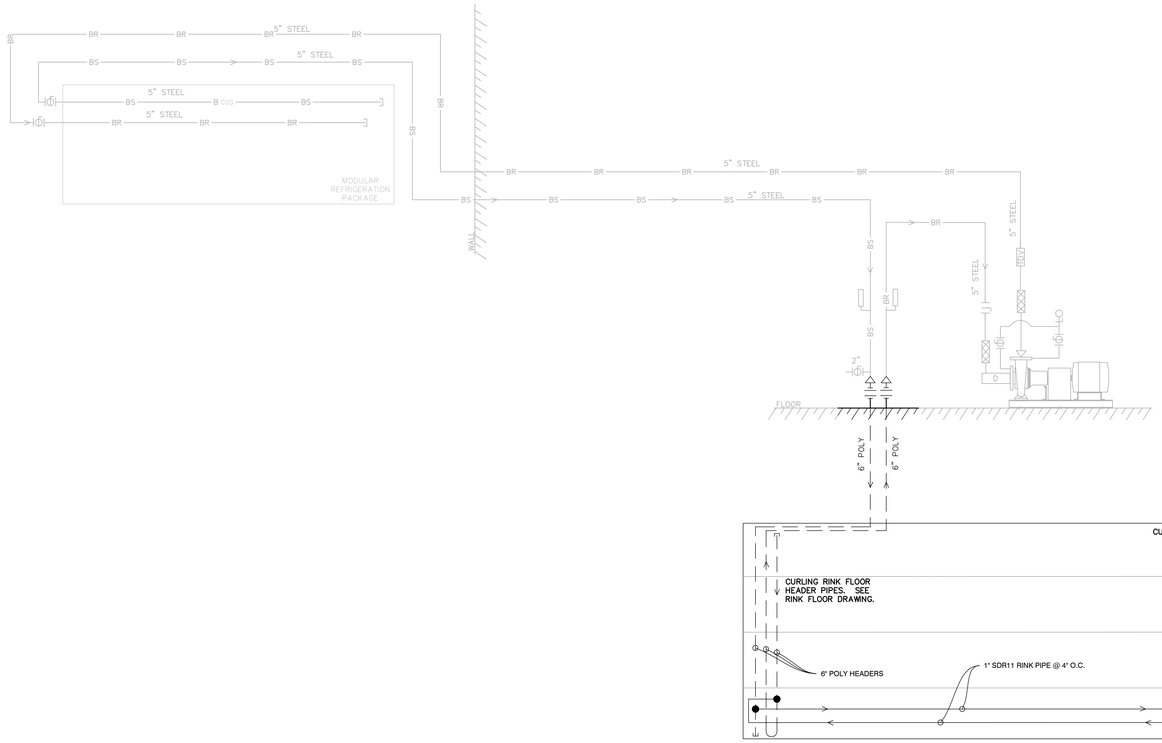
NORTH

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
R501

Kahler Slater
B32°
Engineering Group
2211 O' Neil Road - Hudson, WI 54016
Phone: (651) 256-3090
www.B32eng.com




## GENERAL NOTES

1. THE REFRIGERATION FLOW DIAGRAM SHOWS GENERAL SYSTEM REQUIREMENTS ONLY. ICE CONTRACTOR TO FURNISH AND INSTALL ALL MATERIALS AND PIPING TO MAINTAIN A COMPLETE OPERATING SYSTEM WITH THE EXISTING ICE REFRIGERATION EQUIPMENT, AND AS NECESSARY TO MEET CURRENT STATE AND LOCAL MECHANICAL CODES.
2. EXISTING VALVES, SENSORS, EXPANSION TANKS AND OTHER ACCESSORIES NOT SHOWN. FIELD VERIFY LOCATION AND TYPE OF VALVES AND ACCESSORIES ON THE EXISTING SYSTEM.
3. PIPING MATERIAL AS SPECIFIED. INSULATE ALL PIPING AS SPECIFIED IN INSULATION SCHEDULE. SEE DETAIL ICE-163.
4. FIELD VERIFY EXISTING CHILLER ARRANGEMENT, PIPE ROUTING, AND PIPE SIZES.
5. INSTALL PIPE UNIONS ON EACH SIDE OF ALL EQUIPMENT AND VALVES FOR MAINTENANCE.
6. ALL VALVES AND PIPING SPECIALTIES SHALL BE FULL LINE SIZE.
7. ALL GAUGES SHALL BE MOUNTED AT EYE LEVEL WHERE POSSIBLE.
8. THE CONTRACTOR IS RESPONSIBLE FOR PLACEMENT AND DESIGN OF ALL HANGERS AND SUPPORT SYSTEMS AND SHALL VERIFY THAT BUILDING AND ROOF STRUCTURE IS DESIGNED TO SUPPORT SYSTEM LOADS. **ALL EQUIPMENT, PIPING, TANKS, ETC. SHALL BE GROUND SUPPORTED.**

O KEY NOTES (SEE SPECIFICATIONS FOR CONTROL REQUIREMENTS)

Revisions

CONSTRUCTION DOCUMENTS

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No.
223010.00

CITY OF WAUWATOSA

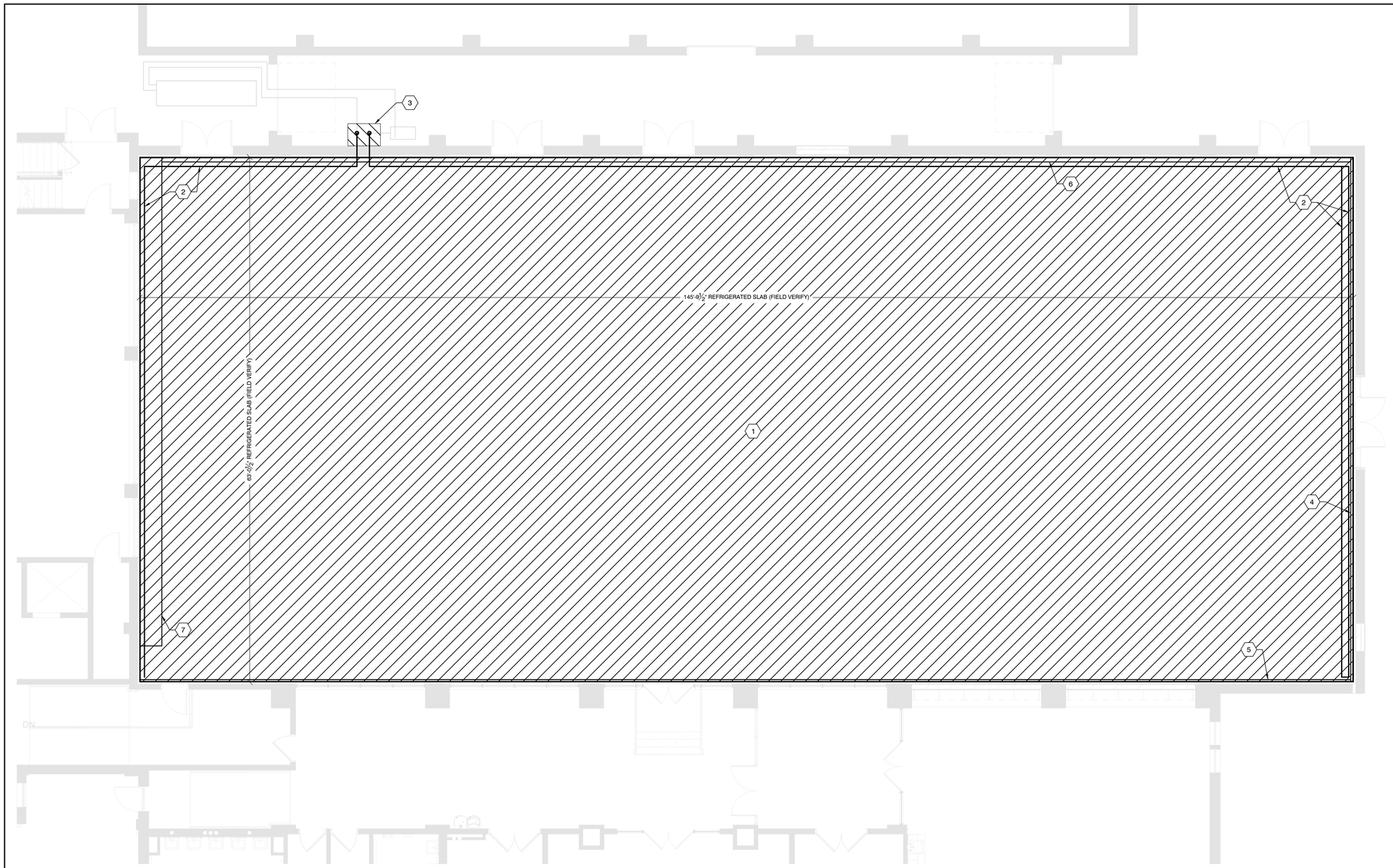
Sheet Title
SECONDARY REFRIGERANT FLOW DIAGRAM

NORTH

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 53202
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
R600




1 CURLING RINK FLOOR DEMOLITION PLAN
SCALE: 3/16" = 1'-0"

## X KEY NOTES:

1. REMOVE AND DISPOSE OF EXISTING CURLING RINK FLOOR IN ITS ENTIRETY, INCLUDING BUT NOT LIMITED TO:
   A. 5" CONCRETE FLOOR WITH REINFORCING AND 1" STEEL PIPING.
   B. PERIMETER EXPANSION JOINT.
   C. (2) OR (3) LAYERS OF FLOOR INSULATION TOTALING 5" THICKNESS AND VAPOR BARRIER.
   D. PIPE AND REBAR SUPPORT CHAIRS
2. REMOVE AND DISPOSE OF EXISTING STEEL HEADER PIPES AND TRANSMISSION MAINS IN HEADER TRENCHES TO/FROM REFRIGERATION ROOM. FIELD VERIFY LOCATIONS OF HEADER PIPES AND TRANSMISSION MAINS.
3. REMOVE CONCRETE FLOOR IN EQUIPMENT ROOM AS NECESSARY TO ACCOMMODATE INSTALLATION OF NEW TRANSMISSION MAIN PIPING.
4. REMOVE 4" BUMPER
5. REMOVE 3.5"x4" WOODEN BOARD
6. REMOVE 7" WOODEN BOARD/ BUMPER ASSEMBLY
7. REMOVE 32" RAISED WOODEN WALKWAY

## GENERAL NOTES:

1. EXISTING CONDITIONS WERE DETERMINED FROM SITE OBSERVATIONS AND VERY LIMITED EXISTING PLANS INFORMATION. AS-BUILT INFORMATION WAS NOT AVAILABLE.
2. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO BIDDING AND START OF CONSTRUCTION. NOTIFY THE ENGINEER IF THERE ARE DISCREPANCIES BETWEEN THE DRAWINGS AND THE FIELD CONDITIONS.
3. DO NOT SCALE DRAWINGS.
4. VERIFY LOCATION OF BURIED UTILITIES PRIOR TO DEMOLITION. VERIFY SIZE, LOCATION AND INVERT ELEVATION OF NEW AND EXISTING UTILITIES PRIOR TO BEGINNING WORK.
5. WORK SHOWN HATCHED SHALL BE REMOVED.
6. INSTALL ALL PROTECTION SYSTEMS AS REQUIRED PRIOR TO STARTING DEMOLITION WORK.
7. REMOVE AND DISPOSE OF ALL PIPING, VALVES, HANGERS, CONTROLS, ELECTRICAL AND OTHER MATERIALS ASSOCIATED WITH EQUIPMENT THAT IS SPECIFIED TO BE REMOVED UNLESS OTHERWISE NOTED.
8. REMOVE AND SALVAGE EXISTING SECONDARY REFRIGERANT PRIOR TO DEMOLITION.
9. CONTRACTOR TO COMPLY WITH ALL APPLICABLE CODES AND ORDINANCES.
10. CUT, PATCH AND PAINT EXISTING WALLS, FLOORS AND CEILINGS AS REQUIRED FOR INSTALLATION OF NEW WORK OR REMOVAL OF EXISTING WORK.
11. IDENTIFY ALL RESTRICTIONS PRIOR TO CUTTING THROUGH EXISTING WALLS, FOUNDATION WALLS, OR PRECAST PANELS.
12. REMOVE FIXTURES AND EQUIPMENT AS INDICATED. CAP PIPING SUCH THAT NEW CONSTRUCTION AND FINISHES CAN BE COMPLETED AS INDICATED AND REQUIRED.
13. ANY DAMAGE TO THE PERIMETER CONCRETE CAUSED BY DEMOLITION SHALL BE REPAIRED BY THE CONTRACTOR.
14. CLEAN ALL FLOOR AND WALL SURFACES AFTER DEMOLITION.
15. PATCH AND PAINT ALL HOLES LEFT BY DEMOLITION.
16. REMOVE ALL EXISTING ELECTRICAL COMPONENTS, CONDUITS, WIRING, ETC. ASSOCIATED WITH REMOVED EQUIPMENT.
17. RELOCATE ALL ELECTRICAL COMPONENTS, CONDUITS, WIRING, ETC. THAT CONFLICT WITH NEW CONSTRUCTION.
18. PROTECT ALL ELECTRICAL ASSOCIATED WITH EQUIPMENT TO REMAIN.
19. SEE DEMOLITION REQUIREMENTS FOR OTHER MECHANICAL, ELECTRICAL, AND BUILDING SYSTEMS SHOWN ELSEWHERE.
20. ALL ITEMS IDENTIFIED TO BE REMOVED SHALL BE DISPOSED OF OFF SITE BY CONTRACTOR.
21. DEMOLITION REMOVAL ROUTE SHALL BE THROUGH EXISTING EXTERIOR DOORS. DEMOLITION REMOVAL ROUTE SHALL NOT GO THROUGH OTHER PARTS OF THE EXISTING FACILITY.

Kahler Slate
B32°
Engineering Group
2211 O' Neil Road - Hudson, WI 54016
Phone: (651) 256-3090
www.B32eng.com

Revisions

CONSTRUCTION DOCUMENT

SCOPE DOCUMENTS

Drawing Date
12/22/2023

MUELLNER BUILDING RENOVATION

7300 W CHESTNUT STREET
WAUWATOSA WI, 53213

Project No. 223010.00
CITY OF WAUWATOSA

Sheet Title
CURLING RINK DEMOLITION PLAN

NORTH

Copyright © 2020 Kahler Slater, Inc. All rights reserved.

790 N Water Street, Suite 1700, Milwaukee, Wisconsin 5320
Telephone 414.272.2000 Fax 414.272.2001

Sheet No.
RD100

# CONTRACT DOCUMENTS
FOR

## MUELLNER BUILDING RENOVATION

IN THE
CITY OF WAUWATOSA, WISCONSIN

**CONTRACT 24-60**

PROJECT 8036
QuestCDN No. 8915570

January 10, 2024

Issued for Board of Public Works Approvals Only
Not To Be Used For Bidding

Plans Prepared by &
Construction Administration:

Kahler Slater
414-272-2000

Project Coordination:

David Simpson, P.E.
Director of Public Works
(414) 831-0799
dsimpson@wauwatosa.net

## DOCUMENT 000103 - COPYRIGHT STATEMENT

Copyright 2024 by Kahler Slater, Inc.

Additional Copyright 2024 by the Consulting Engineers and Construction Specialists for this Project over portions of the documents prepared by those entities.

All rights reserved. No part of these documents may be reproduced in any form without the written permission of the Architects and, where applicable, the Consulting Engineers and Construction Specialists.

Kahler Slater, Inc., utilizes subordinate documents and software provided by American Institute of Architects MasterSpec, under license and permission provided by Deltek. Kahler Slater, Inc., is a licensed user of preprinted forms provided by and under copyright and permission from the Construction Specifications Institute. Supplemental written permission may be necessary to reproduce subordinate materials in any form.

**Kahler Slater** is the corporate logo of Kahler Slater, Inc.

**END OF DOCUMENT**

**DOCUMENT 00 0105.13 - CERTIFICATIONS PAGE - ARCHITECTURAL**

**1.1 ARCHITECTURAL**

I hereby certify that the plans and specifications for Architectural Work were prepared by me or under my direct supervision and that I am a duly Licensed Architect under the laws of the State of Wisconsin.

Printed Name: Jeffrey Piette

Signature:

WISCONSIN JEFFREY J PIETTE A-8620 Milwaukee ARCHITECT

12/22/2023

**END OF DOCUMENT**

**DOCUMENT 00 0105.16 - CERTIFICATIONS PAGE - STRUCTURAL**

**1.1 STRUCTURAL**

I hereby certify that the plans and specifications for Structural Engineering Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Wisconsin.

Printed Name: Patrick D. Reynolds

Signature: Patrick D. Reynolds

WISCONSIN PROFESSIONAL ENGINEER
PATRICK D. REYNOLDS
E-36645
WAUWATOSA
WI

12/22/2023

**END OF DOCUMENT**

**DOCUMENT 00 0105.19 - CERTIFICATIONS PAGE - MEP**

**1.1 PLUMBING**

I hereby certify that the plans and specifications for Plumbing Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Wisconsin.

Printed Name: Jeff Wegner

Signature: Jeff Wegner

WISCONSIN
JEFFREY C. WEGNER
D 1900 P
GRAFTON, WI
DESIGNER

12/22/2023

**1.2 MECHANICAL**

I hereby certify that the plans and specifications for Mechanical Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Wisconsin.

Printed Name: Michael A. Bartley

Signature: Michael A. Bartley

WISCONSIN
MICHAEL A. BARTLEY
D 2037 H
MILWAUKEE, WI
DESIGNER
HVAC

12.22.2023

**1.3 ELECTRICAL**

I hereby certify that the plans and specifications for Electrical Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Wisconsin.

Printed Name: Heather St. Ledger

Signature: Heather St. Ledger

WISCONSIN
HEATHER ST. LEDGER
E-44873
MILWAUKEE, WI
PROFESSIONAL ENGINEER

12-22-2023

**END OF DOCUMENT**

## DOCUMENT 00 0105.20 - CERTIFICATIONS PAGE - ICE

### 1.1 ICE

I hereby certify that the plans and specifications for Ice Work were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Wisconsin.

Printed Name: SCOTT A. WARD

Signature:

WISCONSIN
SCOTT A.
WARD
34714-006
ST. PAUL,
MN
PROFESSIONAL ENGINEER
12-22-23

**END OF DOCUMENT**

## DOCUMENT 00 0110 - TABLE OF CONTENTS


**DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS** (KS unless otherwise indicated)

| | | |
|---|---|---|
| 00 0101 | Project Title Page (City) | 01/10/24 |
| 00 0102 | City Certification Page (City) | 01/10/24 |
| 00 0103 | Copyright Statement | 12/22/23 |
| 00 0105.13 | Certifications Page – Architectural | 12/22/23 |
| 00 0105.16 | Certifications Page – Structural | 12/22/23 |
| 00 0105.19 | Certifications Page – MEP | 12/22/23 |
| 00 0105.20 | Certifications Page – ICE | 12/22/23 |
| 00 0110 | Table of Contents | 12/22/23 |
| 100 | Section 100- Official Notice (City) | 01/10/24 |
| 200 | Section 200- Instructions to Bidders (City) | 01/10/24 |
| 300 | Section 300- Sample Proposal (City) | 01/10/24 |
| 400 | Section 400- Federal Funding and Minimum Wage Requirements | 01/10/24 |
| 500 | Section 500- AIA A201-2017-Conditions of the Contract for Construction | 01/10/24 |
| 600 | Section 600- Special Provisions (City) | 01/10/24 |
| 700 | Section 700- Contract (City) | 01/10/24 |
| 800 | Section 800- Bonds (City) | 01/10/24 |

**DIVISION 01 – GENERAL REQUIREMENTS** (KS unless otherwise indicated)

| | | |
|---|---|---|
| 01 1000 | Summary | 12/22/23 |
| 01 1013 | Scope Documents Definition | 12/22/23 |
| 01 2100 | Allowances | 12/22/23 |
| 01 2500 | Substitution Procedures | 12/22/23 |
| 01 2500.13 | Substitution Request Form | 12/22/23 |
| 01 2613 | Requests for Information | 12/22/23 |
| 01 3100 | Project Management and Coordination | 12/22/23 |
| 01 3129 | Media Distribution Indemnification Form | 12/22/23 |
| 01 3300 | Submittal Procedures | 12/22/23 |
| 01 4000 | Quality Requirements | 12/22/23 |
| 01 4200 | References | 12/22/23 |
| 01 5000 | Temporary Facilities and Controls | 12/22/23 |
| 01 6000 | Product Requirements | 12/22/23 |
| 01 7300 | Execution | 12/22/23 |
| 01 7329 | Cutting and Patching | 12/22/23 |
| 01 7700 | Closeout Procedures | 12/22/23 |

**DIVISION 02 – EXISTING CONDITIONS** (KS)

| | | |
|---|---|---|
| 02 4119 | Selective Demolition | 12/22/23 |

**DIVISION 03 – CONCRETE**

Not Used

**DIVISION 04 – MASONRY** (KS)

| | | |
|---|---|---|
| 04 0120.64 | Brick Masonry Repointing | 12/22/23 |
| 04 0140.62 | Stone Repointing | 12/22/23 |
| 04 2000 | Unit Masonry | 12/22/23 |
| 04 4313.13 | Anchored Stone Masonry Veneer | 12/22/23 |

**DIVISION 05 – METALS** (KS)

| | | |
|---|---|---|
| 05 4000 | Cold-Formed Metal Framing | 12/22/23 |
| 05 5000 | Metal Fabrications | 12/22/23 |
| 05 7300 | Decorative Metal Railings | 12/22/23 |

**DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES** (KS)

| | | |
|---|---|---|
| 06 1053 | Miscellaneous Rough Carpentry | 12/22/23 |
| 06 1643 | Exterior Gypsum Sheathing | 12/22/23 |
| 06 2013 | Exterior Finish Carpentry | 12/22/23 |

06 4116 Plastic-Laminate-Clad Architectural Cabinets ..... 12/22/23

**DIVISION 07 – THERMAL AND MOISTURE PROTECTION** (KS)
07 0150.19 Preparation for Reroofing ..... 12/22/23
07 2119 Foamed-in-Place insulation ..... 12/22/23
07 2500 Weather Barriers ..... 12/22/23
07 4646 Fiber-Cement Siding ..... 12/22/23
07 5323 Ethylene-Propylene-Diene-Monomer (EPDM) Roofing ..... 12/22/23
07 6200 Sheet Metal Flashing and Trim ..... 12/22/23
07 9200 Joint Sealants ..... 12/22/23

**DIVISION 08 – OPENINGS** (KS)
08 1113 Hollow Metal doors and Frames ..... 12/22/23
08 1416 Flush Wood Doors ..... 1129/23
08 1613 Fiberglass Reinforced Plastic (FRP) Doors and Frames ..... 12/22/23
08 3113 Access Doors and Frames ..... 12/22/23
08 4113 Aluminum-Framed Entrances and Storefronts ..... 12/22/23
08 4246 Wood Entrances ..... 12/22/23
08 5200 Wood Windows ..... 12/22/23
08 7100 Door Hardware ..... 12/22/23
08 8000 Glazing ..... 12/22/23

**DIVISION 09 – FINISHES** (KS)
09 0563 Flooring Substrate Acceptance Statement ..... 12/22/23
09 2216 Non-structural Metal Framing ..... 12/22/23
09 2900 Gypsum Board ..... 12/22/23
09 5113 Acoustical Panel Ceilings ..... 12/22/23
09 6513 Resilient Base and Accessories ..... 12/22/23
09 6519 Resilient Tile Flooring ..... 12/22/23
09 9113 Exterior Painting ..... 12/22/23
09 9123 Interior Painting ..... 12/22/23

**DIVISION 10 – SPECIALTIES** (KS)
10 4413 Fire Protection Cabinets ..... 12/22/23
10 4416 Fire Extinguishers ..... 12/22/23

**DIVISION 11 – EQUIPMENT**
Not Used

**DIVISION 12 – FURNISHINGS** (KS)
12 3623.13 Plastic-Laminate-Clad Countertops ..... 12/22/23
12 3661.16 Solid Surfacing Countertops ..... 12/22/23

**DIVISION 13 – SPECIAL CONSTRUCTION** (B32 Engineering)
13 1811 Curling Rink General Requirements ..... 12/22/23
13 1813 Curling Rink Floor System ..... 12/22/23
13 1814 Curling Rink Piping, Valves, and Accessories ..... 12/22/23

**DIVISION 14 – CONVEYING EQUIPMENT**
Not Used

**DIVISION 21 – FIRE SUPPRESSION** (R&D)
21 0500 Basic Fire Protection Requirements ..... 12/22/23
21 0529 Supports and Anchors ..... 12/22/23
21 0553 Identification ..... 12/22/23
21 1000 Piping Fittings and Specialties ..... 12/22/23
21 1300 Automatic Sprinkler Systems ..... 12/22/23

**DIVISION 22 – PLUMBING** (R&D)
22 0500 Basic Plumbing Requirements ..... 12/22/23
22 0510 Excavating and Backfill ..... 12/22/23

| | | |
|---|---|---|
| 22 0511 | Aggregate Materials | 12/22/23 |
| 22 0514 | Plumbing Specialties | 12/22/23 |
| 22 0529 | Supports, Anchors and Penetrations | 12/22/23 |
| 22 0553 | Identification | 12/22/23 |
| 22 1100 | Water Supply System | 12/22/23 |
| 22 1300 | Drain, Waste, Vent, and Conductor Piping | 12/22/23 |
| 22 4200 | Plumbing Fixtures | 12/22/23 |

**DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING** (R&D)

| | | |
|---|---|---|
| 23 0500 | Basic Mechanical Requirements | 12/22/23 |
| 23 0513 | Motors and Electrical Work | 12/22/23 |
| 23 0514 | Variable Frequency Drives | 12/22/23 |
| 23 0529 | Supports and Anchors | 12/22/23 |
| 23 0548 | Vibration Isolation | 12/22/23 |
| 23 0553 | Mechanical Identification | 12/22/23 |
| 23 0593 | Testing, Adjusting and Balancing | 12/22/23 |
| 23 0595 | HVAC System Cleaning | 12/22/23 |
| 23 0713 | Insulation | 12/22/23 |
| 23 0900 | Temperature Controls | 12/22/23 |
| 23 0993 | Sequence of Operation | 12/22/23 |
| 23 0994 | Points Chart | 12/22/23 |
| 23 1123 | Gas Piping and Accessories | 12/22/23 |
| 23 2313 | Refrigerant Piping and Specialties | 12/22/23 |
| 23 3100 | Ductwork | 12/22/23 |
| 23 3300 | Ductwork Accessories | 12/22/23 |
| 23 3416 | Centrifugal Fans | 12/22/23 |
| 23 3700 | Air Outlets and Inlets | 12/22/23 |
| 23 4000 | Air Cleaning Devices | 12/22/23 |
| 23 5416 | Gas Fired Heaters | 12/22/23 |
| 23 7213 | Desiccant Dehumidification Units | 12/22/23 |
| 23 8129 | Variable Refrigerant Flow System | 12/22/23 |

**DIVISION 26 – ELECTRICAL** (R&D)

| | | |
|---|---|---|
| 26 0500 | Common Work Results for Electrical | 12/22/23 |
| 26 0502 | Electrical Demolition for Remodeling | 12/22/23 |
| 26 0503 | Electrical Equipment Mounting Requirements | 12/22/23 |
| 26 0521 | Building Wire and Cable | 12/22/23 |
| 26 0526 | Grounding and Bonding for Electrical Systems | 12/22/23 |
| 26 0529 | Hangers and Supports for Electrical Systems | 12/22/23 |
| 26 0531 | Conduit for Electrical Systems | 12/22/23 |
| 26 0534 | Boxes for Electrical Systems | 12/22/23 |
| 26 0553 | Identification for Electrical Systems | 12/22/23 |
| 26 0571 | Electrical Distribution System Studies | 12/22/23 |
| 26 0811 | Testing Electrical System | 12/22/23 |
| 26 0923 | Lighting Control Devices | 12/22/23 |
| 26 0929 | Digital Distributed Lighting Controls | 12/22/23 |
| 26 2214 | Dry Type Transformers | 12/22/23 |
| 26 2416 | Panelboards | 12/22/23 |
| 26 2726 | Wiring Devices | 12/22/23 |
| 26 2728 | Disconnect Switches | 12/22/23 |
| 26 5000 | Interior Luminaires | 12/22/23 |

**DIVISION 27 – COMMUNICATIONS**

Not Used

**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY** (R&D)

| | | |
|---|---|---|
| 28 1300 | Access Control Security System | 12/22/23 |
| 28 3106 | Fire Alarm System - Intelligent | 12/22/23 |

**DIVISION 31 – EARTHWORK**

Not Used

**DIVISION 32 – EXTERIOR IMPROVEMENTS**
Not Used

**DIVISION 33 – UTILITIES**
Not Used

**DIVISION 41 – MATERIAL PROCESSING AND HANDLING EQUIPMENT**
Not Used

**END OF DOCUMENT**

## SECTION 100 – OFFICIAL NOTICE

OFFICIAL NOTICE TO CONTRACTORS
ADVERTISEMENT FOR BIDS

The City of Wauwatosa will receive proposals for remodeling of certain portions of the Muellner Building located in Hart Park until 11:01 A.M. Local Time, February 14th, 2024 at which time all bids will be publicly opened and read virtually via use of the Zoom platform. Anyone wishing to participate should visit zoom.us/join and use meeting ID: 875 5351 8282 or you may call in by dialing (312) 626-6799.

CONTRACT 24-60 MUELLNER BUILDING RENOVATION

Under this proposal, the Contractor shall furnish all labor, materials, supplies, equipment, tools and other services necessary for the renovation work and all work incidental thereto, all in accordance with contract documents.

The contractor will perform this work at the Muellner Building located in Hart Park in the City of Wauwatosa.

Interested parties may view and obtain digital copies of the contract documents, including plans and specifications, from Quest Construction Data Network. Access the QuestCDN website at www.questcdn.com. Input QuestCDN eBidDoc No. 8915570 on the website's Project Search page. No password is required. Contact QuestCDN.com at 952-233-1632 or info@questcdn.com for assistance in downloading and working with the digital documents.

There is a nonrefundable charge of $25.00 for the plans and contract documents.

**PRE-BID CONFERENCE (Optional):** February 1st at 10:30 AM; Muellner Building, 7300 W. Chestnut Street, Wauwatosa, WI.

Deadline to submit questions via Quest will be February 7th, 2024.

The City will accept only online electronic bids through QuestCDN. To access the electronic bid form, download the project documents and click the online bidding button at the top of the advertisement.

All proposals must be submitted in electronic format together with a bid bond equal to five (5) percent of the bid payable to the City of Wauwatosa, Wisconsin, as a guarantee that if his bid is accepted, the successful bidder will execute and file the proper contract and bonds within ten (10) days after notification of award of the contract.

Failure on the part of the successful bidder to execute his contract and *performance* and *labor & material payment* bonds within ten (10) days from the

date of notice of the award of contract will be considered as just cause for the annulment of the award and the forfeiture of the proposal guarantee to the City not as a penalty but in payment to the City as liquidated damages as a result of such failure.

No bid shall be withdrawn after the opening of bids for a period of sixty (60) days after the scheduled time of closing of bids.

The letting of the work described herein is subject to the provisions of Section 66.09, Wisconsin Statutes, requiring the bidder to furnish proof of responsibility. Bidder prequalification is required on forms furnished by the City of Wauwatosa and submitted to the City Engineer. Prequalification forms that are submitted after 5 days preceding the contract letting date may be cause for the rejecting of bids.

**TIME OF SUBSTANTIAL COMPLETION** The substantial completion date for CONTRACT 24-60 MUELLNER BUILDING ROOM RENOVATION shall be October 25th, 2024. See Section 600 for additional completion requirements.

If the contractor does not complete the work on or before the date set forth above for CONTRACT 24-60 MUELLNER BUILDING ROOM RENOVATION or within the extra time allowed under a City granted time extension, the City will assess liquidated damages. The City will deduct Five Hundred Dollars ($500.00) for every calendar day that the work remains uncompleted from payments due the contractor.

The Contractor will also be charged for each and every day inspection is required after the time of completion has expired. This charge will be based on the actual costs of inspection, construction supervision, clerical and administrative costs, and overhead charges.

A required "Affidavit of Compliance" is included in Section 300 and must be submitted with the bid.

The right to reject or accept any or all bids and the right to waive any informality in bidding is reserved to the City of Wauwatosa, Wisconsin.

Dated at Wauwatosa, Wisconsin January 10th, 2024

Published: 1/24 & 1/31/2024

Steven A. Braatz Jr., City Clerk

City of Wauwatosa, Wisconsin

## SECTION 200 – INSTRUCTIONS TO BIDDERS

200.01 - DESCRIPTION OF WORK The work on this contract consists of the following:

CONTRACT 24-60 MUELLNER BUILDING RENOVATION

Under this proposal, the Contractor shall furnish all labor, materials, supplies, equipment, tools and other services necessary for the remodeling and all work incidental thereto, all in accordance with contract documents.

The contractor will perform this work at the Muellner Building located in Hart Park in the City of Wauwatosa.

200.02 - RETURN OF PROPOSAL GUARANTY The bid deposit(s) of all depositors will be returned after the bids have been accepted by the Common Council and the vouchers for the return of the deposit(s) approved by the Common Council.

200.03 - TIME OF SUBSTANTIAL COMPLETION The substantial completion date for CONTRACT 24-60 MUELLNER BUILDING RENOVATION project shall be October 25th, 2024. See Section 600 for additional completion requirements.

There will be no other extension of time and no extenuating circumstances, except perhaps an industry strike.

If the contractor does not complete the work on or before the date set forth above for CONTRACT 24-60 MUELLNER BUILDING RENOVATION or within the extra time allowed under a City granted time extension, the City will assess liquidated damages. The City will deduct Five Hundred Dollars ($500.00) for every calendar day that the work remains uncompleted from payments due the contractor.

200.04 - BOND REQUIREMENTS In addition to the standard full penalty for nonperformance of Contract, the Contractor's attention is directed to Section 500 that requires a second performance bond guaranteeing labor and material payments.

200.05 - EXAMINATION OF SITE AND CONTRACT DOCUMENTS The bidder is required to examine carefully the site of the work, the proposal, plans specifications, general conditions, official notice to contractors, contract and bond, all as herein contained and known as the contract documents for the work contemplated; it will be assumed that the bidder has investigated and is satisfied as to the requirements of the contract documents. It is mutually agreed that the submission of a proposal shall be considered as conclusive evidence that the bidder has made such examination and is satisfied as to all the conditions and contingencies.

No pleas of ignorance of conditions that exist or that may hereafter exist, or of conditions or difficulties that may be encountered in the execution of the work under this Contract, as a result of failure to make the necessary examinations and investigations

will be accepted as an excuse for any failure or omission on the part of the Contractor to fulfill, in every detail, all of the requirements of the contract documents, or will be accepted as a basis for any claims whatsoever for extra compensation or for an extension of time.

200.06 - INTERPRETATION OF CONTRACT DOCUMENTS AND ADDENDA Should any question arise concerning the true meaning of any part of the contract documents, the bidder may submit to the City a written request for an interpretation thereof. The interpretation of the question so requested will be made as an addendum and either mailed or delivered to all bidders who receive contract documents.

Addenda: Bidders shall acknowledge receipt and incorporation of all addenda at the appropriate location provided in the proposal. Any addenda issued during the time of bidding shall be included with the bid, and in closing a contract they will become a part thereof.

200.07 - PREPARATION OF PROPOSALS The bidder can ONLY submit his proposal through the QuestCDN electronic bidding format. A nominal fee will be charged to the Bidder for an electronic submission of a proposal through QuestCDN.

Wisconsin Statute 77.54(9m) allows a sales and use tax exemption for certain building materials sold to construction contractors for incorporation into public works projects. To claim the exemption, contractors must prepare Wisconsin Form S-211, Sales and Use Tax Exemption Certificate and provide the form to their supplier in compliance with WI 77.54(9m) when purchasing supplies covered by this statute. All other materials, supplies, and equipment purchased by a contractor, sub contractor, or builder for the construction of the work specified under this contract is subject to all applicable sales tax. Proposals are to include all applicable sales tax.

200.08 - REQUIREMENTS FOR SIGNING BIDS

a) Bids, which are not signed by individuals making them, shall have attached thereto a power of attorney evidencing authority to sign the bid in the name of the person for whom it is signed.

b) Bids, which are signed for a partnership, shall be signed by all of the partners or by an attorney-in-fact. If signed by an attorney-in-fact there shall be attached to the bid a power-of-attorney evidencing authority to sign the bid, executed by the partners.

c) Bids, which are signed for a corporation, shall have the corporate name thereof and the signature of the President or other authorized officers of the Corporation, manually written below the corporate name following the word “By _____ __.”

200.09 - INTERPRETATION OF ESTIMATES Not Applicable

200.10 - WHEN AWARD EFFECTUAL The contract shall be deemed as having been awarded when formal notice of award shall have been duly served upon the intended awardee (i.e., the bidder to whom the City contemplates awarding the contract) by some officer or agent of the City duly authorized to give such notice.

200.11 - REQUIRED NUMBER OF EXECUTED CONTRACTS The successful bidder will be required, after the award of the contract, to furnish four (4) counterparts of the contract and bond, no later than 10 days after notification of the award of the contract.

200.12 - WITHDRAWAL OF BIDS Any bidder may withdraw his bid at any time prior to the scheduled time for the receipt of bids.

200.13 - DELIVERY OF PROPOSALS - The bidder can ONLY submit his proposal through the QuestCDN electronic bidding format. A nominal fee will be charged to the Bidder for an electronic submission of a proposal through QuestCDN.

Please note that returning the entire Project Manual is not required; the relevant contract forms, proposals, etc. shall be considered sufficiently complete when submitted through the QuestCDN on-line bidding process.

200.14 - REJECTION OF PROPOSALS Proposals may be rejected, if they show any alterations of form, additions not called for, conditional or alternate bids unless called for, incomplete bids, or irregularities of any kind. Proposals in which the unit prices are obviously unbalanced may be rejected.

200.15 - PROPOSAL GUARANTY No proposal will be considered unless the bid is accompanied by either of the following proposal guarantees:

a) Bid Bond The bidder may accompany his proposal with a bid bond equal to at least five percent (5%) but not more than ten percent (10%) of his bid, made payable to the City of Wauwatosa, Wisconsin, as a guarantee that if his bid is accepted he will execute and file the proper contract and bond within ten (10) days after notification of the award of the contract.

b) Certified Check The bidder may accompany his proposal with a certified check for at least five percent (5%) of the total amount of his bid, made payable to the City of Wauwatosa, Wisconsin, as a guaranty that if his bid is accepted he will execute and file the proper contract and bond within ten (10) days after notification of the award of the contract.

Failure on the part of the successful bidder to execute his contract and performance bond within ten (10) days from the date of notice of the award of contract will be considered as just cause for the annulment of the award and the forfeiture of the proposal guarantee to the City not as a penalty but in payment to the City as liquidated damages as a result of such failure.

200.16 - CONSIDERATION OF PROPOSALS The City reserves the right to reject any or all proposals, to waive technicalities, and to advertise for new proposals, or to proceed to do the work otherwise.

Before any contract is awarded, the bidder may be required to furnish a complete statement of the origin, composition and manufacture of any or all materials to be used in the construction of the work, together with samples, which may be subjected to tests provided for in these specifications to determine their quality and fitness for the work.

200.17 - PAYMENT

**The City will not accept or respond to payment application requests from subcontractors.**

No interest will be paid by the Owner for any delay in making any payment unless the Contractor makes written demand of the Owner for payment of interest for any such delay. In no event, however, will any interest be payable for the 10 day period following the 15th of the calendar month. Interest will be payable at the rate of 5% annually and Wisconsin Statutes Section 66.01335 does not apply.

200.18 - RESPONSIBILITY OF THE CONTRACTOR The Contractor, under this contract, shall protect the City against any damage to the equipment and material being used or installed. Any damage occurring because of failure on the part of the equipment, employees, or supervisors, shall be repaired or replaced by the contractor without cost to the City.

200.19 - QUALIFICATIONS OF BIDDERS All bidders are to furnish proof of responsibility by completing the prequalification form furnished by the City of Wauwatosa. This form is to be obtained from the City Engineer's office and is to be returned to the City Engineer's office in the City Hall of Wauwatosa, Wisconsin, not less than five (5) days prior to the time set for opening of bids as stated in the Official Notice.

200.20 - SUBSTANCE ABUSE PREVENTION PROGRAM

By signing this Bid, the Bidder certifies to the City of Wauwatosa that it has, or will have prior to Contract award, a substance abuse prevention program which complies with State of Wisconsin Act 181 (Chapter 103.503 of the State Statutes) and Section 505.09 - SUBSTANCE ABUSE PREVENTION PROGRAM of these documents. The program must cover all union and non-union employees who work on the Owner's construction sites. Failure to implement such a program prior to award shall result in the Bidder being held to be non-responsible. Following award of the Contract if the Contractor breaches the District Policy by failing to have or to effectively implement the policy, the Owner shall consider this a breach of the Contract by the Contractor and may terminate the Contract. This requirement shall be applicable to all subcontractors with subcontracts in excess of one percent (1%) of the bid.

## SECTION 300 – PROPOSAL

## CONTRACT 24-60 MUELLNER BUILDING RENOVATION

Bids to be received until 11:01 A.M. Local Time, February 14th, 2024.

TO: CITY OF WAUWATOSA
WAUWATOSA, WISCONSIN

The undersigned, having familiarized himself with the local conditions affecting the work and with the contract documents including advertisement for bids, instruction to bidders, general conditions, the form of proposal, the form of contract, form of bond, plan, specifications on file in the office of the City Clerk of the City of Wauwatosa, Wisconsin, hereby proposes to perform everything required to be performed and to provide and furnish all labor, materials, supplies, equipment, tools and other services necessary for remodeling work and work incidental thereto all in accordance with the plans and specifications as prepared by Kahler Slater, including all addenda issued hereto for the prices as listed below.

Addenda: The bidder hereby acknowledges that he has received Addenda Nos. __, ___, ___, (Bidder shall insert No. of each addendum received) and agrees that all addenda are hereby made part of the Contract Documents, and Bidder further agrees that his bid(s) includes all impact resulting from said addenda.

**CONTRACT 24-60 MUELLNER BUILDING RENOVATION**

**Entire Project:**

**Bid for all demolition and construction work as shown on the Construction Drawings and Specification including all labor, materials, supplies, equipment, tools and other services necessary for the renovation work and all work incidental thereto, all in accordance with contract documents.**

TOTAL BID FOR OVERALL PROJECT
*(WORDS)*

_____

_____ **$** _____
(figures)

# SAMPLE PAGE ONLY- Bidding Occurs on Quest

## MATERIAL SUPPLIER & SUBCONTRACTOR LIST

The following Material Suppliers and Subcontractors will be utilized for portions of the Project Work (only list those > $10,000). The apparent low bid contractor is required to complete and submit this form within 24 hours of bid opening and will not be allowed to change suppliers or subcontractors without approval of the City.

| Subcontractor | Classification of Work | Estimated Dollar Amount |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

**AFFIDAVIT OF COMPLIANCE WITH SECTION 103.503 OF THE WISCONSIN STATE STATUTES CONTROLLED SUBSTANCE PREVENTION PROGRAM**

State of _____ Project Name _____

_____

_____ County Contract No. _____

I, _____ , being duly sworn, state that:

1. I am the _____ of _____, a _____
(State)
Corporation, partnership, or individual of _____ , _____
(City, Village, (State)
and make this affidavit pursuant to the requirements of Section 103.503 of the Wisconsin State Statutes.

2. I have entered into the City of Wauwatosa's Contract No. _____ and the total cost (including labor, equipment and materials) of completing the contract will exceed $48,000 if a single-trade project or $200,000 if a multiple trade project.

3. The corporation, partnership or individual I represent has in place a Controlled Substance Prevention Program that is consistent with and meets the requirements of Section 103.503 of the Wisconsin State Statutes.

4. I have confirmed that the subcontractors I plan to employ on this contract also have in place a Controlled Substance Prevention Program that is consistent with and meets the requirements of Section 103.503 of the Wisconsin State Statutes.

| Title | Officer Name | Address |
|---|---|---|
| President | _____ | _____ |
| Vice President | _____ | _____ |
| Secretary | _____ | _____ |
| Treasurer | _____ | _____ |

Subscribed and sworn to before me this _____ Day of _____, 20_____

_____
(Notary Signature)

_____
(Contractor Signature)

Notary Public, State of _____

My Commission expires: _____

2. Accompanying this proposal is a _____
(Bond-Certified Check)
in the sum of _____ Dollars

$ _____ as required by the Advertisement for Bids.

3. This bid is based on the following subcontractors:

| Name | Address | Class of Work |
|---|---|---|
| | | |
| | | |
| | | |

4. I hereby certify that all statements herein are made on behalf of

_____
(Name of Corporation, partnership or person submitting bid)

a corporation organized and existing under the laws of the State of

_____; a partnership consisting of an individual trading as

_____ of the City of _____

State of _____.

that I have examined and carefully prepared this proposal from the plans and specifications and have checked the same in detail before submitting this proposal; that I have full authority to make such statements and submit this proposal in (its) (their) behalf, and that the said statements are true and correct.

Signature _____

_____
(Title, if any)

Sworn and subscribed before me this
_____ day of _____, 20__.

_____
(Notary or other officer authorized to administer oaths).

My Commission expires _____.

(Bidders should not add any conditions or qualifying statements to this proposal, as otherwise the proposal may be declared irregular as being not responsive to the advertisement.)

## SECTION 400 – FEDERAL FUNDING REQUIREMENTS AND MINIMUM WAGE SCALE

This contract includes Federal funding sources. The Contractor shall review and adhere to all requirements within this section.

Minimum wage scale intentionally omitted pursuant to 2015 Wisconsin Act 55, effective January 1, 2017.

**NOTE: CONTRACTOR/CONSULTANT IS REQUIRED TO REGISTER WITH SAMS (Service for Award Management) AND PROVIDE THE UEI NUMBER FOR ALL PROJECTS UTILIZING FEDERAL FUNDS.**

In the event of a conflict between these Terms Required for all City of Wauwatosa Contracts Funded with Federal Grants Subject to the Uniform Guidance ("Federally Required Contract Terms") and the terms of the main body of the Contract or any exhibit or appendix, these Federally Required Contract Terms shall govern.

1. **Debarment and Suspension.** Contractor represents and warrants that, as of the execution of this Contract, neither Contractor nor any subcontractor or sub-consultant performing work under this Contract (at any tier) is included on the federally debarred bidder's list listed on the government-wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." If at any point during Contract's term Contractor or any subcontractor or sub-consultant performing work at any tier is included on the federally debarred bidder's list, Contractor shall notify City immediately. **Contractor's completed Vendor Debarment Certification is attached hereto and incorporated herein**.

2. **Amendment Permitted.** This list of Federally Required Contract terms may be amended by City in the event that the applicable federal grant providing funding for this Agreement contains additional required terms.

3. **Record Retention.** Contractor certifies that it will comply with the record retention requirements detailed in 2 CFR § 200.333. Contractor further certifies that it will retain all records as required by 2 CFR § 200.333 for a period of three (3) years after it receives City notice that City has submitted final expenditure reports or quarterly or annual financial reports, as applicable, and all other pending matters are closed. Unless Contractor is functioning as a sub-recipient of grant funding, rather than as a contractor, this requirement is in addition to, and not in place of, City's public records retention requirements set forth elsewhere herein.

4. **Procurement of Recovered Materials.** Pursuant to 2 CFR §200.323, Contractor represents and warrants that in its performance under the Contract, Contractor shall comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and

establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

5. Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended—If this is a contract or sub-grant in excess of $150,000, Contractor must comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

6. **Energy Efficiency**. Contractor certifies that Contractor will be in compliance with mandatory standards and policies relating to energy efficiency, which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub. L. 94- 163, 89 Stat. 871).

7. **Byrd Anti-Lobbying Amendment** (31 U.S.C. 1352). Contractor certifies that:

7.1. No federal appropriated funds have been paid or will be paid, by or on behalf of Contractor, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal Loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of and Federal contract, grant, loan, or cooperative agreement.

7.2. If any funds other than federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, Contractor shall request from City and provide, completed, to City the "Disclosure Form to Report Lobbying," in accordance with its instructions as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96).

7.3. Contractor shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

**7.4. Contractor's completed Byrd Anti-Lobbying Certification is attached hereto and incorporated herein.**

8. **Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708).** If this Contract is for an amount in excess of $100,000 and involves the employment of mechanics or laborers, Contractor must comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, Contractor must compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

9. **Right to Inventions**. If the federal award is a "funding agreement" under 37 CFR 401.2 and this is an agreement between City or a sub-recipient and a small business firm or nonprofit organization regarding the substitution of parties, assignment of performance or experimental, developmental or research work thereunder, City or sub-recipient will comply with 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

10. **Federal Government is Not a Party**. The Federal Government is not a party to this Contract and is not subject to any obligations or liabilities to City, Contractor, or any other party pertaining to any matter resulting from the Contract.

11. **Copeland "Anti-Kickback" Act (40 U.S.C. 3145)**. If this is a "prime construction contract" in excess of $2,000, Contractor shall, in its performance of the contract, comply with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that Contractor is prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled.

12. **Equal Employment Opportunity.** If this is a "federally assisted construction contract," as defined by 41 CFP Part 60- 1.3, except as otherwise provided in 41 CFR Part 60, in its performance under the contract, the 41 CFP Part 60-1.3 shall comply with the equal opportunity clause provided under 41 CFR 60-

1.4(b), in accordance with Executive Order 11246, “Equal Employment Opportunity” (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and implementing regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.” The text of 41 CFR 60-1.4(b) is available upon request.

13. **Termination for convenience**. If this Contract is for an amount in excess of $10,000 and it lacks a termination for convenience clause, the following applies: City may terminate this Contract at any time for any reason by giving at least thirty (30) days' notice in writing from City to Contractor. If Contractor is terminated for convenience by City, Contractor will be paid for services actually performed or commodity actually provided.

14. **Termination for cause.** If this Contract is for an amount in excess of $10,000 and it lacks a termination for cause clause, the following applies: If Contractor shall fail to fulfill in timely and proper manner any of its obligations or violate any of the provisions of this Contract; City shall have the right to terminate this Contract. City shall notify Contractor of its intent to terminate, by giving Contractor prior written notice at least five (5) business days before the effective date of the termination, identifying the alleged deficiencies in Contractor’s performance, and shall give Contractor thirty (30) days to cure such deficiencies prior to termination. In such event, all deliverables completed by Contractor as of the date of termination shall, at the option of City, become property of City. Notwithstanding the above, Contractor shall not be relieved of liability to City for damages sustained by City by virtue of any breach of the Contract, and City shall retain its remedies under law.

15. **Executive Order 13202- Preservation of Open Competition and Government Neutrality Towards Contractors’ Labor Relations on Federal and Federally Funded Construction Contracts**. These requirements apply to recipients and sub-recipients of awards and cooperative agreements and to any manager of a construction project acting on their behalf. These individuals or employees of one of these organizations must ensure that the bid specifications, project agreements, and other controlling documents do not: (a) require or prohibit bidders, offerors, contractors, or subcontractors to enter into or adhere to agreements with one or more labor organizations, on the same or other related construction project(s); or (b) otherwise discriminate against bidders, offerors, contractors, or subcontractors for becoming or refusing to become or remain signatories, or otherwise to adhere to agreements with one or more labor organizations, on the same or other related construction project(s). Contractors or subcontractors are not prohibited from voluntarily entering into agreements with one or more labor organizations.

16. **Domestic preferences for procurements.** Pursuant to 2 CFR §200.322, as appropriate, and to the extent consistent with law, Contractor should, to the greatest extent practicable under this Contract, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subcontracts and purchase orders for work or products under this Contract.

17. **Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment.** Contractor shall not use funds under this Contract to purchase, or enter into subcontracts to purchase, any equipment, services, or systems that use telecommunications equipment or services as a substantial or essential component of a system that is subject to 2 CFR § 200.216 (generally, video surveillance or telecommunications equipment produced by Huawei Technologies Company, ZTE Corporation, Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company, their subsidiaries or affiliates, or any entity that the Secretary of Defense reasonably believes to bean entity owned or controlled by the government of a foreign country). In the event Contractor identifies covered telecommunications equipment or services that constitute a substantial or essential component of any system, or as critical technology as part of any system that is subject to 2 CFR § 200.216, during Contract performance, Contractor shall alert City as soon as possible and shall provide information on any measures taken to prevent recurrence.

# DEBARMENT CERTIFICATION FORM

The Contractor certifies that, neither the Contractor firm nor any owner, partner, director, officer, or principal of the Contractor, nor any person in a position with management responsibility or responsibility for the administration of federal funds:

(a) Is presently debarred, suspended, proposed for debarment, and declared ineligible or voluntarily excluded from covered transactions by any federal or state department/agency;

(b) Has within a three-year period preceding this certification been convicted of or had a civil judgment rendered against it for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public transaction or contract (federal, state, or local); violation of federal or state antitrust statutes; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Is presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in paragraph (b) above; or

(d) Has within a three-year period preceding this certification had one or more public transactions or contracts (federal, state, or local) terminated for cause or default.

(e) If the contractor is “Actively” registered with SAMS (Service for Award Management), the following UEI (Unique Entity ID) number has been assigned: _____

**Note: Any Federally Funded project over $50,000 requires the Contractor to register with SAMS**

The Contractor further certifies that it shall not knowingly enter into any transaction with any subcontractor, material supplier, or vendor who is debarred, suspended, declared ineligible, or voluntarily excluded from covered transactions by any federal or state department/agency.

Dated this _____ day of _____, 20 _____

By_____
Authorized Signature for Contractor

_____

Printed Name and Title

**BYRD ANTI-LOBBYING AMENDMENT CERTIFICATION**

(To be submitted with each bid or offer exceeding $100,000)

The undersigned, [Company] _____ certifies, to the best of his or her knowledge, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure
Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The Contractor, [Company] _____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. § 3801 *et seq*., apply to this certification and disclosure, if any.

Please check the appropriate box:

_____ No non-federal funds have been used or are planned to be used for lobbying in connection with this application/award/contract.

***or***

_____ Attached is Standard Form LLL, "Disclosure of Lobbying Activities," which describes the use (past or planned) of non-federal funds for lobbying in connection with this application/award/contract.

Executed this _____ day of _____, 20_____

By: _____ _____

(Type or Print Name) (Title of Executing Official)

_____ _____

(Signature of Executing Official) (Name of Organization/Applicant)

## SECTION 400 – FEDERAL FUNDING REQUIREMENTS AND MINIMUM WAGE SCALE

This contract includes Federal funding sources. The Contractor shall review and adhere to all requirements within this section.

Minimum wage scale intentionally omitted pursuant to 2015 Wisconsin Act 55, effective January 1, 2017.

**NOTE: CONTRACTOR/CONSULTANT IS REQUIRED TO REGISTER WITH SAMS (Service for Award Management) AND PROVIDE THE UEI NUMBER FOR ALL PROJECTS UTILIZING FEDERAL FUNDS.**

In the event of a conflict between these Terms Required for all City of Wauwatosa Contracts Funded with Federal Grants Subject to the Uniform Guidance ("Federally Required Contract Terms") and the terms of the main body of the Contract or any exhibit or appendix, these Federally Required Contract Terms shall govern.

1. **Debarment and Suspension.** Contractor represents and warrants that, as of the execution of this Contract, neither Contractor nor any subcontractor or sub-consultant performing work under this Contract (at any tier) is included on the federally debarred bidder's list listed on the government-wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." If at any point during Contract's term Contractor or any subcontractor or sub-consultant performing work at any tier is included on the federally debarred bidder's list, Contractor shall notify City immediately. **Contractor's completed Vendor Debarment Certification is attached hereto and incorporated herein**.

2. **Amendment Permitted.** This list of Federally Required Contract terms may be amended by City in the event that the applicable federal grant providing funding for this Agreement contains additional required terms.

3. **Record Retention.** Contractor certifies that it will comply with the record retention requirements detailed in 2 CFR § 200.333. Contractor further certifies that it will retain all records as required by 2 CFR § 200.333 for a period of three (3) years after it receives City notice that City has submitted final expenditure reports or quarterly or annual financial reports, as applicable, and all other pending matters are closed. Unless Contractor is functioning as a sub-recipient of grant funding, rather than as a contractor, this requirement is in addition to, and not in place of, City's public records retention requirements set forth elsewhere herein.

4. **Procurement of Recovered Materials.** Pursuant to 2 CFR §200.323, Contractor represents and warrants that in its performance under the Contract, Contractor shall comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and

establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

5. Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended—If this is a contract or sub-grant in excess of $150,000, Contractor must comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

6. **Energy Efficiency**. Contractor certifies that Contractor will be in compliance with mandatory standards and policies relating to energy efficiency, which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Pub. L. 94- 163, 89 Stat. 871).

7. **Byrd Anti-Lobbying Amendment** (31 U.S.C. 1352). Contractor certifies that:

7.1. No federal appropriated funds have been paid or will be paid, by or on behalf of Contractor, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal Loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of and Federal contract, grant, loan, or cooperative agreement.

7.2. If any funds other than federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan, or cooperative agreement, Contractor shall request from City and provide, completed, to City the "Disclosure Form to Report Lobbying," in accordance with its instructions as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96).

7.3. Contractor shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

**7.4. Contractor's completed Byrd Anti-Lobbying Certification is attached hereto and incorporated herein.**

8. **Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708).** If this Contract is for an amount in excess of $100,000 and involves the employment of mechanics or laborers, Contractor must comply with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, Contractor must compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

9. **Right to Inventions**. If the federal award is a "funding agreement" under 37 CFR 401.2 and this is an agreement between City or a sub-recipient and a small business firm or nonprofit organization regarding the substitution of parties, assignment of performance or experimental, developmental or research work thereunder, City or sub-recipient will comply with 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

10. **Federal Government is Not a Party**. The Federal Government is not a party to this Contract and is not subject to any obligations or liabilities to City, Contractor, or any other party pertaining to any matter resulting from the Contract.

11. **Copeland "Anti-Kickback" Act (40 U.S.C. 3145)**. If this is a "prime construction contract" in excess of $2,000, Contractor shall, in its performance of the contract, comply with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that Contractor is prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled.

12. **Equal Employment Opportunity.** If this is a "federally assisted construction contract," as defined by 41 CFP Part 60- 1.3, except as otherwise provided in 41 CFR Part 60, in its performance under the contract, the 41 CFP Part 60-1.3 shall comply with the equal opportunity clause provided under 41 CFR 60-

1.4(b), in accordance with Executive Order 11246, “Equal Employment Opportunity” (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and implementing regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.” The text of 41 CFR 60-1.4(b) is available upon request.

13. **Termination for convenience**. If this Contract is for an amount in excess of $10,000 and it lacks a termination for convenience clause, the following applies: City may terminate this Contract at any time for any reason by giving at least thirty (30) days' notice in writing from City to Contractor. If Contractor is terminated for convenience by City, Contractor will be paid for services actually performed or commodity actually provided.

14. **Termination for cause.** If this Contract is for an amount in excess of $10,000 and it lacks a termination for cause clause, the following applies: If Contractor shall fail to fulfill in timely and proper manner any of its obligations or violate any of the provisions of this Contract; City shall have the right to terminate this Contract. City shall notify Contractor of its intent to terminate, by giving Contractor prior written notice at least five (5) business days before the effective date of the termination, identifying the alleged deficiencies in Contractor’s performance, and shall give Contractor thirty (30) days to cure such deficiencies prior to termination. In such event, all deliverables completed by Contractor as of the date of termination shall, at the option of City, become property of City. Notwithstanding the above, Contractor shall not be relieved of liability to City for damages sustained by City by virtue of any breach of the Contract, and City shall retain its remedies under law.

15. **Executive Order 13202- Preservation of Open Competition and Government Neutrality Towards Contractors’ Labor Relations on Federal and Federally Funded Construction Contracts**. These requirements apply to recipients and sub-recipients of awards and cooperative agreements and to any manager of a construction project acting on their behalf. These individuals or employees of one of these organizations must ensure that the bid specifications, project agreements, and other controlling documents do not: (a) require or prohibit bidders, offerors, contractors, or subcontractors to enter into or adhere to agreements with one or more labor organizations, on the same or other related construction project(s); or (b) otherwise discriminate against bidders, offerors, contractors, or subcontractors for becoming or refusing to become or remain signatories, or otherwise to adhere to agreements with one or more labor organizations, on the same or other related construction project(s). Contractors or subcontractors are not prohibited from voluntarily entering into agreements with one or more labor organizations.

16. **Domestic preferences for procurements.** Pursuant to 2 CFR §200.322, as appropriate, and to the extent consistent with law, Contractor should, to the greatest extent practicable under this Contract, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subcontracts and purchase orders for work or products under this Contract.

17. **Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment.** Contractor shall not use funds under this Contract to purchase, or enter into subcontracts to purchase, any equipment, services, or systems that use telecommunications equipment or services as a substantial or essential component of a system that is subject to 2 CFR § 200.216 (generally, video surveillance or telecommunications equipment produced by Huawei Technologies Company, ZTE Corporation, Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company, their subsidiaries or affiliates, or any entity that the Secretary of Defense reasonably believes to bean entity owned or controlled by the government of a foreign country). In the event Contractor identifies covered telecommunications equipment or services that constitute a substantial or essential component of any system, or as critical technology as part of any system that is subject to 2 CFR § 200.216, during Contract performance, Contractor shall alert City as soon as possible and shall provide information on any measures taken to prevent recurrence.

# DEBARMENT CERTIFICATION FORM

The Contractor certifies that, neither the Contractor firm nor any owner, partner, director, officer, or principal of the Contractor, nor any person in a position with management responsibility or responsibility for the administration of federal funds:

(a) Is presently debarred, suspended, proposed for debarment, and declared ineligible or voluntarily excluded from covered transactions by any federal or state department/agency;

(b) Has within a three-year period preceding this certification been convicted of or had a civil judgment rendered against it for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public transaction or contract (federal, state, or local); violation of federal or state antitrust statutes; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Is presently indicted for or otherwise criminally or civilly charged by a governmental entity (federal, state, or local) with commission of any of the offenses enumerated in paragraph (b) above; or

(d) Has within a three-year period preceding this certification had one or more public transactions or contracts (federal, state, or local) terminated for cause or default.

(e) If the contractor is "Actively" registered with SAMS (Service for Award Management), the following UEI (Unique Entity ID) number has been assigned: _____

**Note: Any Federally Funded project over $50,000 requires the Contractor to register with SAMS**

The Contractor further certifies that it shall not knowingly enter into any transaction with any subcontractor, material supplier, or vendor who is debarred, suspended, declared ineligible, or voluntarily excluded from covered transactions by any federal or state department/agency.

Dated this _____ day of _____, 20 _____

By_____
Authorized Signature for Contractor

_____

Printed Name and Title

**BYRD ANTI-LOBBYING AMENDMENT CERTIFICATION**

(To be submitted with each bid or offer exceeding $100,000)

The undersigned, [Company] _____ certifies, to the best of his or her knowledge, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
3. The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure
Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The Contractor, [Company] _____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. § 3801 *et seq*., apply to this certification and disclosure, if any.

Please check the appropriate box:

_____ No non-federal funds have been used or are planned to be used for lobbying in connection with this application/award/contract.

***or***

_____ Attached is Standard Form LLL, "Disclosure of Lobbying Activities," which describes the use (past or planned) of non-federal funds for lobbying in connection with this application/award/contract.
Executed this _____ day of _____, 20_____

By: _____ _____

(Type or Print Name) (Title of Executing Official)

_____ _____

(Signature of Executing Official) (Name of Organization/Applicant)

# Section 500

## AIA Document A201™– 2017

# AIA® Document A201™– 2017

## *General Conditions of the Contract for Construction*

**The following PROJECT:**
*(Name and location or address)*

Muellner Building Renovation
7300 W. Chestnut Street
Wauwatosa, WI 53213

**THE OWNER:**
*(Name, legal status and address)*

City of Wauwatosa
7725 W. North Avenue
Wauwatosa, WI 53213

**THE ARCHITECT:**
*(Name, legal status and address)*

Kahler Slater, Inc.
790 N. Water Street, Suite 1700
Milwaukee, WI 53202

**ADDITIONS AND DELETIONS:**
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.
This document has important legal consequences.
Consultation with an attorney is encouraged with respect to its completion or modification.
For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

**TABLE OF ARTICLES**


**1 GENERAL PROVISIONS**

**2 OWNER**

**3 CONTRACTOR**

**4 ARCHITECT**

**5 SUBCONTRACTORS**

**6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

**7 CHANGES IN THE WORK**

**8 TIME**

**9 PAYMENTS AND COMPLETION**

**10 PROTECTION OF PERSONS AND PROPERTY**

**11 INSURANCE AND BONDS**

**12 UNCOVERING AND CORRECTION OF WORK**

**13 MISCELLANEOUS PROVISIONS**



**ELECTRONIC COPYING** of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

## 14 TERMINATION OR SUSPENSION OF THE CONTRACT

## 15 CLAIMS AND DISPUTES

**AIA Document A201™ – 2017.** Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017 by The American Institute of Architects. **All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at **User Notes:**

**INDEX**
(Topics and numbers in bold are Section headings.)


**Acceptance of Nonconforming Work**
9.6.6, 9.9.3, **12.3**
Acceptance of Work
9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3
**Access to Work**
**3.16**, 6.2.1, 12.1
Accident Prevention
10
Acts and Omissions
3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.3.2, 14.1, 15.1.2, 15.2
Addenda
1.1.1
Additional Costs, Claims for
3.7.4, 3.7.5, 10.3.2, 15.1.5
**Additional Inspections and Testing**
9.4.2, 9.8.3, 12.2.1, **13.4**
**Additional Time, Claims for**
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**
**Administration of the Contract**
3.1.3, **4.2**, 9.4, 9.5
Advertisement or Invitation to Bid
1.1.1
Aesthetic Effect
4.2.13
**Allowances**
**3.8**
**Applications for Payment**
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10
Approvals
2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10.1, 4.2.7, 9.3.2, 13.4.1
**Arbitration**
8.3.1, 15.3.2, **15.4**
**ARCHITECT**
**4**
**Architect**, Definition of
**4.1.1**
Architect, Extent of Authority
2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1
Architect, Limitations of Authority and Responsibility
2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.4, 9.6.4, 15.1.4, 15.2
Architect's Additional Services and Expenses
2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4
Architect's Administration of the Contract
3.1.3, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.5, 3.1.3, 3.5, 3.10.2, 4.2.7
Architect's Authority to Reject Work
3.5, 4.2.6, 12.1.2, 12.2.1
Architect's Copyright
1.1.7, 1.5
Architect's Decisions
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.4.2, 15.2
Architect's Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4
Architect's Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.!
Architect's Interpretations
4.2.11, 4.2.12
Architect's Project Representative
4.2.10
Architect's Relationship with Contractor
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2
Architect's Relationship with Subcontractors
1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3
Architect's Representations
9.4.2, 9.5.1, 9.10.1
Architect's Site Visits
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Asbestos
10.3.1
Attorneys' Fees
3.18.1, 9.6.8, 9.10.2, 10.3.3
Award of Separate Contracts
6.1.1, 6.1.2
**Award of Subcontracts and Other Contracts for Portions of the Work**
**5.2**
**Basic Definitions**
**1.1**
Bidding Requirements
1.1.1
Binding Dispute Resolution
8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1
Bonds, Lien
7.3.4.4, 9.6.8, 9.10.2, 9.10.3
**Bonds, Performance, and Payment**
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**
**Building Information Models Use and Reliance**
**1.8**
Building Permit
3.7.1
**Capitalization 1.3**
Certificate of Substantial Completion
9.8.3, 9.8.4, 9.8.5
**Certificates for Payment**
4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4



**AIA Document A201™ – 2017.** Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017 by The American Institute of Architects. **All rights reserved. WARNING: This AIA® Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA® Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This draft was produced by AIA software at **User Notes:**

Certificates of Inspection, Testing or Approval
13.4.4
Certificates of Insurance
9.10.2
**Change Orders**
1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
**Change Orders**, Definition of
**7.2.1**
**CHANGES IN THE WORK**
2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5
**Claims**, Definition of
**15.1.1**
Claims, Notice of
1.6.2, 15.1.3
**CLAIMS AND DISPUTES**
3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1
**Claims for Additional Cost**
3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
**Claims for Additional Time**
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
**Concealed or Unknown Conditions, Claims for 3.7.4**
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
15.4.1
**Cleaning Up 3.15**,
6.3
Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**
**Commencement of the Work**, Definition of
**8.1.2**
**Communications**
3.9.1, **4.2.4**
Completion, Conditions Relating to
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 14.1.2, 15.1.2
**COMPLETION, PAYMENTS AND 9**
Completion, Substantial
3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3
Concealed or Unknown Conditions
3.7.4, 4.2.8, 8.3.1, 10.3
Conditions of the Contract
1.1.1, 6.1.1, 6.1.4
Consent, Written
3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 15.4.4.2
**Consolidation or**
**Joinder 15.4.4**
**CONSTRUCTION BY OWNER**
**OR BY SEPARATE**
**CONTRACTORS**
1.1.4, **6**
**Construction Change Directive**, Definition of
**7.3.1**
**Construction Change Directives**
1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1
Construction Schedules,
Contractor's 3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
**Contingent Assignment of**
**Subcontracts 5.4**, 14.2.2.2
**Continuing Contract**
**Performance 15.1.4**
**Contract**, Definition of
**1.1.2**
**CONTRACT, TERMINATION**
**OR SUSPENSION OF THE**
5.4.1.1, 5.4.2, 11.5, **14**
Contract
Administration
3.1.3, 4, 9.4, 9.5
Contract Award and Execution, Conditions Relating to
3.7.1, 3.10, 5.2, 6.1
Contract Documents, Copies Furnished and Use of 1.5.2, 2.3.6, 5.3
**Contract Documents**, Definition of
**1.1.1**
**Contract Sum**
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5, 15.2.5**
**Contract Sum**, Definition of
**9.1**
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
**Contract Time**,
Definition of 8.1.1
**CONTRA**
**CTOR 3**
Contractor, Definition of
**3.1, 6.1.2**
**Contractor's Construction and**
**Submittal Schedules**
**3.10**, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2
Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.3, 14.1, 14.2.1.1
**Contractor's Liability**
**Insurance 11.1**

Contractor's Relationship with Separate Contractors and Owner's Forces
3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4
Contractor's Relationship with Subcontractors 1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4
Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.4, 15.1.3, 15.2.1
Contractor's Representations
3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2
Contractor's Responsibility for Those Performing the Work
3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8
Contractor's Review of Contract Documents 3.2
Contractor's Right to Stop the Work
2.2.2, 9.7
Contractor's Right to Terminate the Contract 14.1
Contractor's Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3
Contractor's Superintendent 3.9, 10.2.6
Contractor's Supervision and Construction Procedures
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4
Coordination and Correlation
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1
Copies Furnished of Drawings and Specifications 1.5, 2.3.6, 3.11
Copyrights 1.5, **3.17**
Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1
**Correlation and Intent of the Contract Documents 1.2**
**Cost**, Definition of **7.3.4**
Costs
2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 14
**Cutting and Patching 3.14**, 6.2.5
Damage to Construction of Owner or Separate Contractors
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4
Damages, Claims for
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2, 11.3, 14.2.4, 15.1.7
Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2
**Date of Commencement of the Work**, Definition of **8.1.2**
**Date of Substantial Completion**, Definition of **8.1.3**
**Day**, Definition of **8.1.4**
Decisions of the Architect
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 14.2.2, 14.2.4, 15.1, 15.2
**Decisions to Withhold Certification**
9.4.1, **9.5**, 9.7, 14.1.1.3
Defective or Nonconforming Work, Acceptance, Rejection and Correction of
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1
Definitions
1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1
**Delays and Extensions of Time**
**3.2**, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**, 10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5
**Digital Data Use and Transmission 1.7**
Disputes
6.3, 7.3.9, 15.1, 15.2
**Documents and Samples at the Site 3.11**
**Drawings**, Definition of **1.1.5**
Drawings and Specifications, Use and Ownership of 3.11
Effective Date of Insurance 8.2.2
**Emergencies**
**10.4**, 14.1.1.2, **15.1.5**
Employees, Contractor's
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.3, 14.1, 14.2.1.1
Equipment, Labor, or Materials
1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Execution and Progress of the Work
1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4
Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, **15.2.5**
**Failure of Payment**
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Faulty Work
(See Defective or Nonconforming Work) **Final Completion and Final Payment** 4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3
Financial Arrangements, Owner's 2.2.1, 13.2.2, 14.1.1.4 **GENERAL PROVISIONS 1**

**Governing Law 13.1**
Guarantees (See Warranty)
**Hazardous Materials and Substances**
10.2.4, **10.3**
Identification of Subcontractors and Suppliers 5.2.1
**Indemnification**
3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3
**Information and Services Required of the Owner**
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Intent of the Contract
Documents 1.2.1, 4.2.7, 4.2.12, 4.2.13
Interest 13.5
**Interpretation**
1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written 4.2.11, 4.2.12
Judgment on Final
Award 15.4.2
**Labor and Materials, Equipment**
1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes 8.3.1
Laws and Regulations
**Initial Decision 15.2**
**Initial Decision Maker, Definition of**
1.1.8
Initial Decision Maker, Decisions
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.
9.9.1, 10.2.2, 13.1, 13.3.1, 13
15.4
Liens
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10
Limitations, Statutes of 12.2.5, 15.1.2, 15.4.1.1
Limitations of Liability
3.13, 9.6.4,
14, 15.2.8,
15.2.8
**Injury or Damage to Person or Property**
**10.2.8**, 10.4
Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.4
Instructions to Bidders 1.1.1
Instructions to the Contractor
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2
**Instruments of Service**, Definition of
**1.1.7**
Insurance
6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5,
**11**
Insurance, Notice of Cancellation or Expiration 11.1.4, 11.2.3
**Insurance, Contractor's Liability 11.1**
Insurance, Effective Date of 8.2.2,
14.4.2
**Insurance, Owner's Liability 11.2**
**Insurance, Property 10.2.5**,
11.2, 11.4, 11.5
Insurance, Stored Materials 9.3.2
**INSURANCE AND BONDS 11**
Insurance Companies, Consent to Partial Occupancy 9.9.1
Insured loss, Adjustment and Settlement of 11.5
3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6, 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3, 11.3, 12.2.5, 13.3.1
Limitations of Time
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15, 15.1.2, 15.1.3, 15.1.5
**Materials, Hazardous**
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2
Means, Methods, Techniques,
Sequences and Procedures of
Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic's Lien
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
**Mediation**
8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1, 15.4.1.1
**Minor Changes in the Work**
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**
**MISCELLANEOUS**
**PROVISIONS 13**
**Modifications**, Definition of
**1.1.1**
Modifications to the Contract
1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2
**Mutual**
**Responsibility 6.2**
**Nonconforming Work, Acceptance of**
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of 2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2
**Notice**
**1.6**, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4, 3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4, 8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1, 13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5, 15.1.6, 15.4.1
**Ownership and Use of Drawings,**
**Specifications and Other Instruments of**
**Service**
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3

**Partial Occupancy or Use**
9.6.6, **9.9**
**Patching,**
**Cutting and**
**3.14**, 6.2.5
Patents 3.17
**Payment, Applications for**
Notice of Cancellation or Expiration of Insurance 11.1.4, 11.2.3
**Notice of Claims**
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 14.2.3, 14.2.4, 14.4.3
**Payment, Certificates for**
, 9.8.5, 9.10.1, 1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6, 15.2.8, 15.3.2, 15.4.1
Notice of Testing and Inspections
13.4.1, 13.4.2
Observations, Contractor's 3.2, 3.7.4
Occupancy 2.3.1, 9.6.6, 9.8
Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1
**OWNER 2**
**Owner**, Definition of
**2.1.1**
**Owner, Evidence of Financial Arrangements 2.2**, 13.2.2, 14.1.1.4
**Owner, Information and Services Required of the**
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7
**Owner's Insurance 11.2**
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
**Owner's Right to Carry Out the Work 2.5**, 14.2.2
**Owner's Right to Clean Up 6.3**
**Owner's Right to Perform Construction and to Award Separate Contracts**
**6.1**
**Owner's Right to Stop the Work 2.4**
Owner's Right to Suspend the Work 14.3
Owner's Right to Terminate the Contract 14.2, 14.4
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4
**Payment, Failure of**
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3
**Payment Bond, Performance Bond and**
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
**Payments, Progress**
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
**PAYMENTS AND COMPLETION 9**
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, **9.6**, 9.6.7, 14.2.1.2
PCB 10.3.1
**Performance Bond and Payment Bond**
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
**Permits, Fees, Notices and Compliance with Laws**
2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2
**PERSONS AND PROPERTY, PROTECTION OF**
**10**
Polychlorinated Biphenyl 10.3.1
**Product Data**, Definition of
**3.12.2**
**Product Data and Samples, Shop Drawings**
3.11, **3.12**, 4.2.7
**Progress and Completion**
4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4
**Progress Payments**
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
**Project**, Definition of
**1.1.4**
Project Representatives
4.2.10
**Property Insurance**
10.2.5, **11.2**
**Proposal Requirements**
1.1.1
**PROTECTION OF PERSONS AND PROPERTY 10**
Regulations and Laws
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Rejection of Work
4.2.6, 12.2.1
Releases and Waivers of Liens 9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work 3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10
Retainage
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3
**Review of Contract Documents and Field Conditions by Contractor**
**3.2**, 3.12.7, 6.1.3
Review of Contractor's Submittals by Owner and Architect
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2

Review of Shop Drawings, Product Data and
Samples by Contractor
3.12
**Rights and Remedies**
1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1,
6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2,
12.2.4, **13.3**, 14, 15.4
**Royalties, Patents and Copyrights 3.17**
Rules and Notices for Arbitration
15.4.1
**Safety of Persons and Property 10.2**,
10.4
**Safety Precautions and Programs**
3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4
**Samples**, Definition of
**3.12.3**
**Samples, Shop Drawings, Product Data and**
3.11, **3.12**, 4.2.7
**Samples at the Site, Documents and 3.11**
**Schedule of Values 9.2**,
9.3.1
Schedules, Construction
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Separate Contracts and Contractors
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2
**Separate Contractors**, Definition of
**6.1.1**
**Shop Drawings**, Definition of
**3.12.1**
**Shop Drawings, Product Data and Samples**
3.11, **3.12**, 4.2.7
**Site, Use of 3.13**,
6.1.1, 6.2.1
Site Inspections
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4
Site Visits, Architect's
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4
Special Inspections and
Testing 4.2.6, 12.2.1,
13.4
**Specifications**, Definition of
**1.1.6**
**Specifications**
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of
Limitations
15.1.2,
15.4.1.1
Stopping the
Work 2.2.2, 2.4,
9.7, 10.3, 14.1
Stored Materials
6.2.1, 9.3.2, 10.2.1.2, 10.2.4
**Subcontractor**, Definition of
**5.1.1 SUBCONTRACTORS**
**5**
Subcontractors, Work by
1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4,
9.3.1.2, 9.6.7
**Subcontractual Relations**
**5.3**, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1
Submittals
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3,
9.8, 9.9.1, 9.10.2, 9.10.3
Submittal
Schedule
3.10.2,
3.12.5, 4.2.7
**Subrogation, Waivers of**
6.1.1, **11.3**
**Substances,**
**Hazardous 10.3**
**Substantial Completion**
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3,
12.2, 15.1.2
**Substantial Completion**, Definition of
**9.8.1**
Substitution of
Subcontractors 5.2.3,
5.2.4
Substitution of
Architect 2.3.3
Substitutions of
Materials 3.4.2,
3.5, 7.3.8
**Sub-subcontractor**, Definition of
**5.1.2**
Subsurface Conditions 3.7.4
**Successors and Assigns 13.2**
**Superintendent 3.9**, 10.2.6
**Supervision and Construction Procedures**
1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4,
7.1.3, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6,
9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2,
15.2.7
Surety, Consent of 9.8.5,
9.10.2, 9.10.3
Surveys 1.1.7,
2.3.4
**Suspension by the Owner for Convenience 14.3**
Suspension of the Work 3.7.5,
5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
**Taxes**
3.6, 3.8.2.1, 7.3.4.4
**Termination by the Contractor 14.1**,
15.1.7
**Termination by the Owner for Cause**
5.4.1.1, **14.2,** 15.1.7
**Termination by the Owner for Convenience 14.4**
Termination of the Architect 2.3.3
Termination of the Contractor Employment 14.2.2

**TERMINATION OR SUSPENSION OF THE CONTRACT**
**14**
**Tests and Inspections**
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**
**TIME 8**
**Time, Delays and Extensions of**
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5
Time Limits
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4
**Time Limits on Claims**
3.7.4, 10.2.8, 15.1.2, 15.1.3
Title to Work 9.3.2, 9.3.3
**UNCOVERING AND CORRECTION OF WORK**
**12**
**Uncovering of Work 12.1**
Unforeseen Conditions, Concealed or Unknown 3.7.4, 8.3.1, 10.3
Unit Prices 7.3.3.2, 9.1.2
Use of Documents
1.1.1, 1.5, 2.3.6, 3.12.6, 5.3
**Use of Site 3.13**, 6.1.1, 6.2.1
**Values, Schedule of 9.2**, 9.3.1
Waiver of Claims by the Architect 13.3.2
Waiver of Claims by the Contractor 9.10.5, 13.3.2, **15.1.7**
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**
Waiver of Consequential Damages 14.2.4, 15.1.7
Waiver of Liens 9.3, 9.10.2, 9.10.4
**Waivers of Subrogation**
6.1.1, **11.3**
**Warranty**
**3.5**, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2
Weather Delays 8.3, 15.1.6.2
**Work**, Definition of
**1.1.3**
Written Consent
1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3, 13.2, 13.3.2, 15.4.4.2
Written Interpretations 4.2.11, 4.2.12
Written Orders
1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

## ARTICLE 1 GENERAL PROVISIONS

### § 1.1 Basic Definitions

### § 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

The contract documents are complimentary, and what is called for in one shall be as binding as if called for in all. The true intent of the plans and these specifications is to provide for the construction, execution and completion in every detail of a complete work or improvement which the Contractor undertakes to do in full compliance with the plans, specifications, official notice, general conditions, proposal and the contract. The Contractor shall perform all items of work covered and stipulated in the proposal and perform altered or extra work, all in accordance with the lines, grades, typical sections and dimensions given, and shall furnish, (unless otherwise provided), all materials, implements, machinery, equipment, tools, supplies, transportation and labor necessary to the prosecution and completion of the work.

### § 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

### § 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

All Work acceptably completed under the contract shall be measured by United States standard measures in accordance with well recognized engineering practice and quantities of work performed shall be computed from such measurements.

The completed Work will be measured by the Owner and Architect to determine the quantities of the various items of Work performed. The Contractor will, in all cases, be paid for the actual amount of Work performed in accordance with these specifications as shown by the final measurements, said measurements being made in accordance with the terms of the contract.

### § 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

### § 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

### § 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

**§ 1.1.7 Instruments of Service**
Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

**§ 1.1.8 Initial Decision Maker**
The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

**§ 1.2 Correlation and Intent of the Contract Documents**
**§ 1.2.1** The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

**§ 1.2.1.1** The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

**§ 1.2.2** Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

**§ 1.2.3** Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

**§ 1.3 Capitalization**
Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

**§ 1.4 Interpretation**
In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

**§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service**
**§ 1.5.1** The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

**§ 1.5.2** The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

**§ 1.6 Notice**
**§ 1.6.1** Unless otherwise provided, where, in any of the contract documents, there is any provision in respect to giving of any notices, such notice shall be deemed to have been given, as to the Owner, when written notice shall be delivered to the Architect and the Owner or their authorized agent or shall have been placed in the United

States mails addressed to the chief executive of the Owner at the place where the bids or proposals for the contract were opened; as to the Contractor, when a written notice shall be delivered to the chief representative of the Contractor at the site of the project or by mailing such written notice in the United States mails addressed to the Contractor at the place stated in the papers prepared by them to accompany the Contractor's proposal as the address of the Contractor's permanent place of business; as to the surety on the performance bond, when a written notice is placed in the United States mails addressed to the surety at the home office of such surety or its agent or agents who executed such performance bond on behalf of such surety.

**§ 1.7 Digital Data Use and Transmission**
The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

**§ 1.8 Building Information Models Use and Reliance**
Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

**ARTICLE 2 OWNER**
**§ 2.1 General**
**§ 2.1.1** The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

**§ 2.1.2** The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

**§ 2.2 Information and Services Required of the Owner**
**§ 2.2.1** Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

**§ 2.2.2** The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

**§ 2.2.3** If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

**§ 2.2.4** The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

**§ 2.2.5** The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

**§ 2.2.6** Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

**§ 2.3 Owner's Right to Stop the Work**
If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

**§ 2.4 Owner's Right to Carry Out the Work**
If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

**ARTICLE 3 CONTRACTOR**
**§ 3.1 General**
**§ 3.1.1** The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

**§ 3.1.2** The Contractor shall perform the Work in accordance with the Contract Documents.

**§ 3.1.3** The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

**§ 3.1.4** Contractor's Responsibility for Work. The work shall be under the charge and care of the Contractor until final acceptance by the City . The Contractor shall assume all responsibility for injury or damage to the work by action of the elements or for any cause whatsoever, whether arising from the execution or partial or complete failure in execution of the work. The Contractor shall rebuild, restore and make good, at their own expense, all injuries or damages to any portion of the work occasioned by any causes before its completion and acceptance.

**§ 3.1.5** Contractor's Warranties. In consideration of, and to induce the award of this Contract, the Contractor represents and warrants:

.1 That the Contractor is not in arrears to the Owner upon debt or contract, and that Contractor is not a defaulter, as surety, Contractor, or otherwise.

.2 That Contractor is financially solvent and sufficiently experienced and competent to perform the work.

.3 That the work can be performed as called for by the contract.

.4 That the facts stated in the Contractor's proposal and the information given by the Contractor are true and correct in all respects.

.5 That Contractor is fully informed regarding all the conditions affecting the work to be done and labor and materials to be furnished for the completion of this contract, and that the information was secured by personal investigation and research.

**§ 3.2 Review of Contract Documents and Field Conditions by Contractor**

**§ 3.2.1** Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

**§ 3.2.2** Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractorand not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

**§ 3.2.3** The Contractor is not required to ascertain that the Contract Documents are in accordance withapplicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

**§ 3.2.4** If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

**§ 3.3 Supervision and Construction Procedures**

**§ 3.3.1** The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

**§ 3.3.2** The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

.1 The Contractor shall employ such superintendents, foremen, and workers as are careful and competent. If any persons employed on the work by the Contractor shall be found by the Owner or Architect to be incompetent or negligent in the performance of their duties or neglects or refuses to comply with directions given, employee shall be discharged immediately on the written requests of the Architect or Owner, and such persons shall not again be reemployed on the work. Should the Contractor continue to employ such person or persons, the Architect or Owner may suspend the work until such orders are complied with.

.2 All machinery and equipment used by the Contractor on the work shall be of sufficient size and in such mechanical condition as to meet with the requirements of the work and to produce a satisfactory quality of work.

.3 When so ordered by the Architect or Owner in writing, unsatisfactory equipment shall be removed and replaced with equipment that will satisfactorily perform the work. Failure of the Contractor to provide adequate equipment may result in the default of the contract.

.4 Pursuant to Section 3.9, the Contractor shall at all times have a competent superintendent capable of reading and thoroughly understanding the plans and specifications, as their agent on the work, who shall receive instructions from the Owner or their authorized representatives. The Superintendent shall have full authority to execute the orders or directions of the Architect and Owner without delay and to supply promptly such materials, tools, plant equipment and labor as may be required.

**§ 3.3.3** The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

**§ 3.4 Labor and Materials**

**§ 3.4.1** Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

**§ 3.4.2** Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.5 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

**§ 3.4.3** The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

**§ 3.5 Warranty**

**§ 3.5.1** The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All materials not conforming to the requirements of these specifications shall be considered as defective, and all such materials, whether in place or not, shall be rejected and shall be removed immediately from the work by the Contractor at the Contractor's expense, unless otherwise permitted by the Owner. No rejected materials, the defects of which have been subsequently corrected, shall be used until approval has been given. Upon failure on the part of the Contractor to immediately comply with any order of the Owner relative to the provisions of this article, the Owner shall have the authority to remove and replace such defective material and to deduct the cost of removal and replacement from any monies due or which may become due the Contractor.

**§ 3.5.2** All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

**§ 3.5.3** "Or Equal" Clause.

Whenever in any of the contract documents 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," if not inserted, shall be implied. The specific article, material or equipment mentioned shall be understood as indicating the type, function,

minimum standard of design, efficiency and quality desired and shall not be construed in such a manner as to exclude manufacturers' products of comparable quality, design, or efficiency. The Contractor shall comply with the requirements of the contract documents relative to the Owner's approval of materials and equipment before they are incorporated in the project. The Architect shall decide and shall be the final authority on all questions which arise as to the quality of alternate materials referred to above.

**§ 3.6 Taxes**
The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

Section 77.54(9m), Wis. Stats., provides an exemption from sales and use tax for property sold to a construction contractor who, in fulfillment of a real property construction activity, transfers the property to a qualifying exempt entity, if the property becomes part of a facility in Wisconsin that is owned by the qualifying exempt entity.

The Contractor is encouraged to use this exemption on qualifying facilities at the time of bid. After execution of the contract, any cost increase as a result of a change in the work shall exclude sales and use tax on materials for qualifying facilities per Section 77.54(9m), Wis. Stats. "Facility" means any building, shelter, parking lot, parking garage, athletic field, athletic park, storm sewer, water supply system, or sewerage and waste water treatment facility. "Facility" does NOT include a highway, street, road, or anything not specifically listed above.

**§ 3.7 Permits, Fees, Notices and Compliance with Laws**
**§ 3.7.1** Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

**§ 3.7.2** The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

**§ 3.7.3** If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

**§ 3.7.4** The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work. The City shall waive all permit fees for permits required to be obtained through City Departments.

**§ 3.7.5 Concealed or Unknown Conditions**
Should the Contractor encounter or the Owner discover during the progress of the work, subsurface and/or latent conditions at the site materially differing from those shown on the drawing or indicated in these specifications, the attention of the Owner and Architect shall be called immediately to such conditions, and, if Architect finds that the materials differ from those shown on the drawings, or indicated in these specifications, Architect shall at once make such changes in the drawings and/or specifications, as Architect and/or Owner may find necessary. If either party disputes the determination of the conditions , that party may submit a Claim as provided in Article 15.

**§ 3.7.6** If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

**§ 3.8 Allowances**
**§ 3.8.1** The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct,

but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

**§ 3.8.2** Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

**§ 3.8.3** Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

**§ 3.9 Superintendent**

**§ 3.9.1** The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

**§ 3.9.2** The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

**§ 3.9.3** The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

**§ 3.10 Contractor's Construction and Submittal Schedules**

**§ 3.10.1** The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

**§ 3.10.2** The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

**§ 3.10.3** The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

**§ 3.11 Documents and Samples at the Site**

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

**§3.11.1** Samples and Tests. The Contractor shall provide such facilities as the Architect may require for collecting and forwarding samples, and shall not make use of or incorporate in the work any material represented by these samples until the tests have been made and the material found to be acceptable in accordance with the requirements of the specifications. The Contractor shall furnish without charge all samples required.

**§3.11.2** When required by the Architect, representative preliminary samples of the character and quality prescribed shall be submitted by the Contractor or producer for examination and shall be tested in accordance with the methods referred to herein. The acceptance of preliminary sample, however, shall not be construed as acceptance of the material from the same source delivered later. Only the materials actually delivered for the work will be considered and their acceptance or rejection will be based solely on the results of the tests prescribed in these specifications. All samples shall be submitted before shipment of the material to the site of the work and in ample time to permit making tests or examinations before incorporating the material into the work.

**§3.11.3** All tests shall be made in accordance with the methods described in these specifications. If any specifications are inadvertently omitted, those of the A.S.T.M. or other recognized societies for such materials will be used. References to A.S.T.M. or other recognized societies, specifications shall be understood to mean the latest revision of the standard specifications. Laboratory tests shall be made by a recognized laboratory acceptable to the Architect. Reports of tests provided by the Contractor shall be submitted promptly to the Architect.

**§3.11.4** The Contractor shall give timely notice to the Architect of the place and time of the test to be made, to permit the Architect to witness the test if they should so desire. All tests shall be made at the sole expense of the Contractor.

**§ 3.12 Shop Drawings, Product Data and Samples**

**§3.12.1** The approved plans will be supplemented by such shop drawings as are necessary to adequately control the work. It is mutually agreed that all authorized alterations affecting the requirements and information given on the approved plans shall be in writing. No changes shall be made on any plan or drawing after the same has been approved by the Architect except by direction of the Architect.

**§3.12.2** Shop Drawings and Samples

.1. Contractor shall submit Shop Drawings and Samples to Architect for review and approval. Each submittal will be identified as Architect may require.

.2. Shop Drawings:

i. Submit number of copies specified in the General Requirements.

ii. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Owner the services, materials, and equipment Contractor proposes to provide and to enable Architect to review the information for the limited purposes required by the Architect's Review, as noted below.

.3 Samples:

i. Submit number of Samples specified in the Specifications.

ii. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Architect may require to enable Architect to review the submittal for the limited purposes required by Architect's Review, as noted below.

.4. Where a Shop Drawing or Sample is required by the Contract Documents, any related Work performed prior to Architect's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

.5. Submittal Procedures:

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal. Submittals not bearing a stamp or specific written certification will be returned without review to the contractor for resubmittal.

3. With each submittal, Contractor shall give Architect specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Architect for review and approval of each such variation.

.6. Architect's Review:

1. Architect will provide timely review of Shop Drawings and Samples. Architect's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in 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. Architect's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Architect's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Section 3.12.2.5.3 and Architect has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Architect's review and approval shall not relieve Contractor from responsibility for complying with the requirements of the Submittal Procedures.

.7. Resubmittal Procedures:

1. Contractor shall make corrections required by Architect 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 Architect on previous submittals.

2. The Contractor shall be allowed one (1) submittal of each item for review. Additional submittals required due to non-conformance with the specifications, including rejected or incomplete

submittals, will be assessed $250 per item per resubmittal. Any amounts assessed under this specification shall be deducted from payment for the work.

**§3.12.3** Conformity with Plans and Allowable Deviations. Finished work in all cases shall conform with lines, grade, sections, details and dimensions of the work contemplated as shown on the approved plans. Such deviations from the approved plans and shop drawings, as may be required by the exigencies of construction, will, in all cases, be determined by the Architect and authorized in writing.

**§3.12.4** Coordination of Plans – Specifications, Etc.
The specifications, the plans and all supplementary documents are essential parts of the contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be compatible to describe and provide for a complete work.

In case of discrepancy between documents, the governing order is as follows:

1. Addenda
2. Special Provisions (Section 600)
3. Plans
4. Wauwatosa Standard Specifications
5. All Other Specifications
6. Appendices and other documents intended to be incorporated into the contract

If there is a discrepancy on a drawing, the drawing dimension, unless obviously incorrect, govern over scaled dimensions. If there is a discrepancy in the plans, the typical sections or details govern over any standard detail drawing.

The Contractor shall take no advantage of any apparent error or omission in the plans or specifications and the Architect shall be permitted to make such corrections and interpretations as may be deemed necessary for the fulfillment of the intent of the plans and specifications.

**§ 3.13 Use of Site**
The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

**§3.13.1** Cooperation by Contractor. The Contractor shall conduct their operations so as to interfere as little as possible with those of other Contractors, subcontractors or the public on or near the work.

**§3.13.2** The Contractor shall arrange and conduct their work so as not to interfere with the operations of other Contractors engaged on adjacent work and to join the work of this contract, including any additional, authorized work, to that of others in a proper manner and in accordance with the spirit of the plans and specifications and to perform his work in the proper sequence to that of other adjacent work all as may be directed by the Architect or Owner. The Contractor shall be held responsible for any damage done by the Contractor or the Contractor's agents to the work performed by another contractor.

**§3.13.3** In case of a dispute arising between two or more Contractors engaged on the same work, as to the respective rights of each under these specifications, the Architect shall determine the matters at issue and shall define the respective rights of the various interests involved in order to secure the completion of all parts of the work in general harmony and with satisfactory results, and their decision shall be final and binding on all parties concerned and shall not in any way be a cause for claims for extra compensation by any of the parties.

**§3.13.4** Public Convenience and Safety. After the contract has been executed, the Contractor shall notify the Owner and Architect, at the earliest possible date, of the starting of any construction work which might in any way inconvenience or adversely impact traffic, so that arrangements may be made, if necessary, for closing the street or alley and providing detours. No street shall be closed to the public except by express permission of the Owner. The Contractor shall at all times conduct the work in such a manner as to insure the least obstruction to traffic. The convenience of the general public and of residents along the street or alley shall be provided for in an adequate and satisfactory manner. Temporary bridges for pedestrians shall be provided as required, over new pavement, sidewalks or excavations at all street or alley intersections.

.1 The Contractor shall contact the Fire and Police Departments at least seventy two (72) hours with advance notice in writing before it becomes necessary to close a street or part of a street.

.2 Fire hydrants shall be accessible at all times to the Fire Department. No material or obstructions shall be placed closer to a fire hydrant than ten (10) feet.

.3 The Contractor shall give notice in writing to the proper authorities in charge of streets, gas and water pipes, sewer mains, electric or other conduits, railroad, poles, manholes, catch basins, and all other property that may be affected by the Contractor's operation, at least seventy-two (72) hours before breaking ground. The Contractor shall not hinder or interfere with any persons in the protection of such work or in the operation of utilities at any time except with permission of the Owner. The Contractor shall protect such utilities from any injury and shall avoid all unnecessary exposure so they will not cause injury to the public. In case of damage, the cost of making repairs will be charged to the Contractor.

**§3.13.5** Barricades and Warning Signs. When any section of the street is closed or partially obstructed to the use of traffic, the Contractor shall provide and erect at each end of the closed street and at all intersecting streets or at the place where the street is partially obstructed to the use of traffic, substantial barricades of a design approved by the Owner, and shall place at the same points warning signs in conformance with the Manual on Uniform Traffic Control Devices (MUTCD) and Wisconsin MUTCD Supplement. The Contractor shall also furnish and place on or adjacent to the barricades, lights and other adequate warning devices to protect the work properly and to provide for the safety and convenience of the traveling public at night. The Contractor shall maintain constantly such barricades, signs and lights from the date of closing of the street or obstruction in the street until such time as, in the judgment of the Owner, they are no longer necessary.

.1 When all traffic is to be maintained over the street during the construction, the Contractor shall provide and maintain such barricades, signs, lights and security guards as may be necessary to protect the work properly and to provide for safe and convenient public travel.

.2 If, during the progress of the work, it is necessary to provide access to private property along the street, the Contractor shall provide and maintain within the closed portion of the street such barricades, signs and lights as may be necessary to protect the work and to safeguard the local traffic.

.3 Whenever any section of the street is opened to traffic before all work on that section is completed, or while construction operations are being conducted thereon, the Contractor shall place and maintain at each end of the section and at all points of possible danger, suitable signs warning the public of such construction operations.

.4 The Contractor will be held responsible for all damages to the work due to failure of barricades, signs, lights and security guards to protect it whenever evidence of such damage is found prior to acceptance. The Owner may order the damaged portion immediately removed and replaced by the Contractor without cost to the Owner if, in their opinion, such action is justified. The Contractor's responsibility for the maintenance of barricades, signs and lights shall not cease until project shall have been accepted, and in the event the Contractor shall fail or neglect to maintain all such necessary barricades, signs and lights, the Owner shall maintain same at the expense of the Contractor and the Owner shall withhold such expense from the compensation due the Contractor.

**§3.13.6** Limitation of Operations. The Contractor shall conduct the work so as to create a minimum amount of inconvenience to vehicular and foot traffic. At any time when, in the judgment of the Owner or Architect the Contractor has obstructed or closed, or is carrying on operations on a greater portion of the street than is necessary for the proper prosecution of the work, the Owner or Architect may require the Contractor to finish the sections on which work is in progress before work is started on any additional section.

**§3.13.7** Work Hour Restrictions. Site and exterior work operations , including daily startup activities under this contract, shall be limited to the period from 7 A.M. to 9 P.M. Monday thru Friday, during the life of the contract except those work operations identified in the plans or specifications . Internal work, when noise will not generate a nuisance or disrupt neighbors, shall not be restricted. Provide three (3) days' notice to the Owner for work proposed between 9 P.M. and 7 A.M. for coordination purposes. If,in the opinion of the Architect, or their authorized representative, unusual circumstances dictate work outside of these hours is warranted due to an emergency condition, or special circumstance, such authorization by the Architect or their representative to extend

the working hours beyond those stated herein, shall be given in writing and, if authorized, shall be on a single incidence basis for a specific day. For all other work that is not deemed an unusual circumstance, the Contractor shall follow the procedures outlined on the Board of Public Works Application found at: https://www.wauwatosa.net/government/departments/city-clerk/licenses-permits. Submit completed applications to: tengineering@wauwatosa.net. .

**§3.13.8** The Contractor will be supplied one copy of the executed contract documents and an electronic pdf copy of the construction plans, construction specifications, and any subsequent necessary revisions. The Contractor shall at all times have available on the job site one copy of said contract documents complete with any revisions to the plans or specifications; Contractor shall give the work the constant attention necessary to facilitate the progress thereof and shall cooperate with the Architect and with the other Contractors in every way possible.

**§ 3.14 Cutting and Patching**
**§ 3.14.1** The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

**§ 3.14.2** The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

**§ 3.15 Cleaning Up**
**§ 3.15.1** The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract.

**§ 3.15.2 Final Cleaning Up.** Within five (5) calendar days after the completion of the work and before acceptance and payment will be made, the Contractor shall clean and remove from the site of the work and adjacent property all surplus and discarded materials, rubbish and temporary structures, restore in an acceptable manner all property, both public and private, which has been damaged in the prosecution of the work and shall leave the site of the work in a neat and presentable condition.

**§ 3.15.3** If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

**§ 3.16 Access to Work**
The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

**§ 3.17 Royalties, Patents and Copyrights.** It is mutually understood and agreed that without exception contract prices are to include all royalties and costs arising from patents, trademarks and copyrights in any way involved in the work. It is the intent that whenever the Contractor is required or desires to use any design, device, material or process covered by letters, patent or copyright, the right for such use shall be provided for by suitable legal agreement with the patentee or owners and copy of this agreement shall be filed with the City Clerk and a copy with the Owner, however, whether or not such agreement is made or filed as noted, the Contractor and the surety in all cases shall indemnify and save harmless the Owner and Architect from any and all claims for infringement by reasons of the use of any such patented design, device, material or process to be performed under the contract, and shall indemnify the said Owner and Architect for any losses, costs, expenses, damages, or judgments which it may be obliged to pay, by reason of any such infringement at any time during the prosecution or after the completion of the work.

**§ 3.18 Indemnification**
**§ 3.18.1** Contractor shall indemnify, save harmless, and defend Owner, and Architect against any and all lawsuits, claims, demands, liabilities, losses and expenses, including attorneys' fees and administrative expenses, that may arise, or be alleged to have arisen, out of or in connection with Contractor's, or its subcontractors' or Suppliers', performance of, or failure to perform, the work or any part thereof, whether or not due or claimed to be done in whole or in part to the active, passive, or concurrent negligence or fault of Contractor, except to the extent caused by

the sole negligence of Owner, or Architect including, without limitation lawsuits, claims, demands, liabilities, losses, and expenses for or on account of:

.1. Any delays or interference or damage to other Contractors; and
.2. Labor equipment, materials, or supplies furnished under this Contract, including all liens or notices of liens on account thereof or Contractor's failure to remove or discharge same; and
.3. Contractor's failure to obtain any required permits, licenses, approvals, or authorizations; and
.4. Bodily injury, sickness, disease, or death sustained by any Person or Persons or injury or damage to, or loss or destruction of, any property; and
.5. Any act or omission of Contractor or any of its subcontractors or Suppliers, including but not limited to any failure to fulfill the terms of, or comply with, any laws or to pay any taxes, contributions, or premiums; and
.6. Infringement, alleged infringement, or use of patent rights in connection with the work and the use by Owner of any equipment, materials, supplies, processes, or inventions furnished under this contract.

**§3.18.2** As much of the money due the said Contractor under and by virtue of this contract as shall be considered necessary by the Owner for indemnification purposes may be retained for the use of the Owner; or in case no money is due, the Contractor's surety shall be held until such suit or suits, action or actions, claim or claims, judgment or judgments, for injuries or damages as aforesaid shall have been settled or satisfied and suitable evidence to that effect furnished to the Owner.

The Owner shall not be liable to the Contractor for damages or delays resulting from work by third parties or by injunctions or other restraining orders obtained by third parties.

The Contractor agrees to pay, and guarantees the payment of, all claims for labor performed and materials furnished, used or consumed in making the improvement or performing the work herein provided for, without limitation, together with premiums for workmen's compensation, all as provided and required by Section 779.14 of the Wisconsin Statutes. The Contractor, under these specifications, shall carry liability insurance to indemnify the Owner and the public for injuries sustained by reason of the carrying on of the work. The Contractor shall furnish evidence that they have complied with Chapter 102, Wisconsin Statutes.

**§3.19 Substance Abuse Prevention Program**. The Contractor shall develop, implement and maintain a Substance Abuse Prevention Program as established by Section 103.503 of the Wisconsin State Statutes, and all acts amendatory thereof and supplementary thereto. This statute establishes certain prohibitions against the use and distribution of drugs and alcohol by employees of contractors and subcontractors that have been awarded contracts for or are performing work on public works projects subject to Wisconsin's prevailing wage requirements.

The program must cover all union and non-union employees who work on the Owner's construction sites. Failure to implement such a program prior to award shall result in the Bidder being held to be non-responsible. Following award of the Contract if the Contractor breaches the District Policy by failing to have or to effectively implement the policy, the Owner shall consider this a breach of the Contract by the Contractor and may terminate the Contract. This requirement shall be applicable to all subcontractors with subcontracts in excess of one percent (1%) of the bid.

The act specifically provides that effective May 1, 2007, contractors, subcontractors and their respective employees must comply with the following requirements:

.1. Employees on covered public works projects are prohibited from (a) using, possessing, attempting to possess, distributing, delivering or being under the influence of drugs while performing work on covered public works projects, and (b) using or being under the influence of alcohol while performing work on covered public works projects.

.2. Before a contractor or subcontractor begins a covered public works project, the contractor or subcontractor must have a written program for the prevention of substance abuse, including:

.1 A prohibition against the use of drugs or alcohol while working on covered public works projects.

.2 A requirement that contractor's or subcontractor's employees submit to random, reasonable suspicion and post-accident drug and alcohol tests.

.3 A requirement that contractor's and subcontractor's employees submit to drug and alcohol tests before beginning work on covered public works projects, unless those employees have been participating in a random testing program during the preceding 90 days.

.4 A procedure for notifying employees that fail a test or refuse to submit to testing that they may not perform work on covered public works projects until they submit to and pass drug and alcohol tests.

.3. Each contractor and subcontractor is required to pay for the development, implementation and enforcement of its own substance abuse program. These costs cannot be passed on to covered public works projects.

.4. Contractors and subcontractors cannot allow employees that fail a test or refuse to submit to substance abuse tests to work on covered public works projects.

.5. All substance abuse testing must be conducted in accordance with guidelines for laboratory testing procedures and chain of custody procedures established by the Substance Abuse and Mental Health Services Administration of the Federal Department of Health and Human Services.

**ARTICLE 4 ARCHITECT**

**§ 4.1 General**

**§ 4.1.1** The Architect is the person or entity retained by the Owner pursuant to Section 2.2.2 and identified as such in the Agreement.

**§ 4.1.2** Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

**§ 4.2 Administration of the Contract**

**§ 4.2.1** The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

**§ 4.2.2** The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

**§ 4.2.3** On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

**§ 4.2.4 Communications**

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications

by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

**§ 4.2.5** Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

**§ 4.2.6** The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

**§ 4.2.7** The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

**§ 4.2.8** The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.5.

**§ 4.2.9** The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.11.

**§ 4.2.10** If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

**§ 4.2.11** The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

**§ 4.2.12** Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

**§ 4.2.13** The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

**§ 4.2.14** The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

**ARTICLE 5 SUBCONTRACTORS**

**§ 5.1 Definitions**

**§ 5.1.1** A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

**§ 5.1.2** A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

**§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work**

**§ 5.2.1** Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. The Contractor shall not subcontract any work to be performed or any materials to be furnished in the performance of the contract without the written consent of the Owner.

**§ 5.2.2**The Contractor shall not contract with a proposed person or entity to whom the Owner has not provided written consent. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

**§ 5.2.3** The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

**§5.2.4** If the Contractor shall sublet any part of this contract, the Contractor shall be as fully responsible to the Owner for the acts and omissions of their subcontractor(s) and of the persons either directly or indirectly employed by any subcontractor(s) as Contractor is for the acts and omissions of the persons directly employed by the Contractor. The Contractor must perform with their own organization, work amounting to at least one-third of the original contract amount unless a larger portion is specified in the contract.

**§ 5.3 Subcontractual Relations**

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub- subcontractors.

**§ 5.4 Contingent Assignment of Subcontracts**

**§ 5.4.1** Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- **.1** assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- **.2** assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract. When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

**§ 5.4.2** Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

**§ 5.4.3** Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

**ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

**§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts**

**§ 6.1.1** The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

**§ 6.1.2** When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

**§ 6.1.3** The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

**§ 6.1.4** Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

**§ 6.2 Mutual Responsibility**

**§ 6.2.1** The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

**§ 6.2.2** If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

**§ 6.2.3** The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

**§ 6.2.4** The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

**§ 6.2.5** The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

**§ 6.3 Owner's Right to Clean Up**

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

**ARTICLE 7 CHANGES IN THE WORK**

**§ 7.1 General**

**§ 7.1.1** Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

**§ 7.1.2** A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

**§ 7.1.3** Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

**§ 7.1.4 Changes**. Notwithstanding the above, the Owner or Architect may at any time, by a Construction Change Directive, and with notice to the sureties, make changes in the plans and/or specifications of this contract all within the general scope thereof.

**§7.1.5 Extra Work**. The Contractor may be ordered by the Owner or Architect with a Construction Change Directive to perform additional work and furnish materials which do not appear in the proposal or contract as a specific item accompanied by a unit price, or lump sum price, and which are not included under the price bid for other items in the contract. All such work and materials shall be designated as extra work. The Contractor shall perform extra work whenever it is deemed necessary or desirable by the Owner or Architect to fully complete the project as contemplated and it shall be done in accordance with the intent of these specifications.

Extra work shall be done under the supervision of the Owner and Architect and their decision shall be final and binding. The plan of the work to be followed, the equipment to be used and the amount and character of labor to be employed shall meet with the approval of the Owner and Architect. Authorization for extra work shall be given by the Owner and Architect in writing. The Contractor shall perform the extra work by force account when so ordered by the Owner or Architect. Claims for extra work which have not been authorized by the Owner and Architect will be rejected.

**§7.1.6** Special Work. Should any construction or requirements not covered by these general conditions become necessary, special provisions for the same will be prepared which special provisions shall be considered as a part of these specifications the same as though contained fully herein.

**§ 7.2 Change Orders**

**§ 7.2.1** A Change Order is a written instrument prepared by the Architect and signed by the Owner and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

**§ 7.3 Construction Change Directives**

**§ 7.3.1** A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

**§ 7.3.2** A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

**§ 7.3.3** If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

**§ 7.3.4** If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

**§ 7.3.5** If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

**§ 7.3.6** Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

**§ 7.3.7** A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

**§ 7.3.8** The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

**§ 7.3.9** Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

**§ 7.3.10** When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

**§ 7.4 Minor Changes in the Work**

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a

minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

**ARTICLE 8 TIME**

**§ 8.1 Definitions**

**§ 8.1.1** Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

**§ 8.1.2** The date of commencement of the Work is the date established in the Agreement.

**§ 8.1.3** The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

**§ 8.1.4** The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

**§ 8.2 Progress and Completion**

**§ 8.2.1** Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

**§ 8.2.2** The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

**§ 8.2.3** The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

**§ 8.3 Delays and Extensions of Time**

**§ 8.3.1** If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

**§ 8.3.2** Claims relating to time shall be made in accordance with applicable provisions of Article 15.

**§ 8.3.3 Temporary Suspension of Work.** The Owner or Architect shall have authority to suspend the work wholly or in part for such period or periods as they may deem necessary, due to unsuitable weather or such conditions as are considered unfavorable for the suitable prosecution of the work or for such time as it is necessary due to the failure on the part of the Contractor to carry out orders given or perform any and all provisions of the contract.

**§ 8.3.4 Extension of Contract Time for Completion.** The time for completion of the work contemplated will be as herein specified and it is understood that the completion of the work within the time specified is an essential part of this contract.

The contract time shall start on the date of the Architect's notice to the Contractor to proceed with the work.

If the Contractor finds it is impossible to complete the work on or before the time specified for completion, they may make written request for extension of time. Contractor shall set forth fully in their request the reasons the Contractor believes justify the granting of their request.
If the Architect finds that the work was delayed because of conditions beyond the control of the Contractor, or that the quantities of work done or to be done are in excess of the estimated quantities by an amount sufficient to warrant additional time, it may grant an extension of time for completion as appears reasonable and proper. The extended time for completion shall then be considered as in full force and effect as if it were theoriginal time for completion.

**§8.3.5 Failure to Complete Work on Time.** The time for completion of the work contemplated will be as herein specified and it is understood that the completion of the work within the time specified is an essential part of this

contract. The contract time shall start on the date of the Architect's notice to the Contractor to proceed with the work.

If the Contractor finds it is impossible to complete the work on or before the time specified for completion, they may make written request for extension of time. Contractor shall set forth fully in their request the reasons the Contractor believes justify the granting of their request.

If the Owner finds that the work was delayed because of conditions beyond the control of the Contractor, or that the quantities of work done or to be done are in excess of the estimated quantities by an amount sufficient to warrant additional time, it may grant an extension of time for completion as appears reasonable and proper. The extended time for completion shall then be considered as in full force and effect as if it were theoriginal time for completion.

**§ 8.3.6** This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

**ARTICLE 9 PAYMENTS AND COMPLETION**

**§ 9.1 Contract Sum**

**§ 9.1.1** The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

**§ 9.1.2** If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

**§ 9.2 Schedule of Values**

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

**§ 9.3 Applications for Payment**

**§ 9.3.1** At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

**§ 9.3.1.1** As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations ofthe Architect, but not yet included in Change Orders.

**§ 9.3.1.2** Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

**§ 9.3.2** Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

**§ 9.3.3** The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

**§9.3.4 Right to Withhold Certain Amounts and Make Application Thereof.** In addition to the payment to be retained by the Owner as retainage, the Owner may withhold a sufficient amount of any payment otherwise due to the Contractor, to cover (a) payments that may be past due or payable for just claims for labor or materials furnished in and about the performance of the work on the Project under the contract, (b) for defective work not remedied, (c) for failure of the Contractor to make proper payments to subcontractors, or others caused by the act of neglect of the Contractor or of any of their subcontractors, agents, or employees, and (e) for any past due and unpaid obligations owing by the Contractor to the Owner. The Owner shall disburse and the Contractor does authorize the Owner to act as agent for the Contractor in disbursing such funds as have been withheld pursuant to this paragraph to the party or parties who are entitled to payment therefrom. The Owner will render to the Contractor a proper accounting of all such fund disbursed in behalf of the Contractor.

**§ 9.4 Certificates for Payment**

**§ 9.4.1** The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

**§ 9.4.2** The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

**§ 9.5 Decisions to Withhold Certification**

**§ 9.5.1** The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;

**.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

**.7** repeated failure to carry out the Work in accordance with the Contract Documents.

**§ 9.5.2** When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

**§ 9.5.3** When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

**§ 9.5.4** If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

**§9.5.5** Contractor's Warranty of Title. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

**§9.6.1** After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

**§ 9.6.2** The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

**§ 9.6.3** The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

**§ 9.6.4** The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

**§ 9.6.5** The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

**§ 9.6.6** The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

**§ 9.6.7** A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

**§ 9.6.8** Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

**§ 9.6.9** Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

**§ 9.7 Failure of Payment**
If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

**§ 9.8 Substantial Completion**
**§ 9.8.1** Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

**§ 9.8.2** When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

**§ 9.8.3** Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

**§ 9.8.4** When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

**§ 9.8.5** The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

**§ 9.9 Partial Occupancy or Use**
**§ 9.9.1** The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The

stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

**§ 9.9.2** Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

**§ 9.9.3** Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

**§9.10 Project Acceptance**.

§**9.10.1** The Contractor shall notify the Architect when the project is substantially complete as defined in Article 9.10.3.1. As soon as practicable, the Architect will inspect the work and categorize it as one of the following:

.1. Unacceptable or not complete.
.2. Substantially complete.
.3. Complete.

**§9.10.2 If Unacceptable or Not Complete.**

.1 The Architect will identify, in writing, work that is unacceptable or not complete. Immediately correct or complete that work. The Architect will assess contract time until the work is corrected or completed.

.2 The Contractor shall proceed as specified in Article 9.11.1 until the Architect determines that the work is complete.

**§9.10.3 If Substantially Complete.**

.1. Architect will provide a written punch list enumerating work the contractor must perform and documents the contractor must submit before the Owner will categorize the work as complete.

i. Punch list work includes uncompleted cleanup work required under Article 3.15 and minor corrective work. Immediately correct or complete the punch list work. The Architect may restart contract time if the contractor does not complete the punch list work within 14 calendar days of the Architect issuing the written punch list. The Architect and Contractor may mutually agree to extend this 14- day requirement.
ii. Punch list documents include whatever contract required documentation is missing. The Architect may restart contract time if the contractor does not submit the punch list documents within 14 calendar days of the Architect issuing the written punch list. Architect and Contractor may mutually agree to extend this 14-day requirement.

.2. Proceed as specified in Article 9.11.1 until the Architect determines that the work is complete.

**§9.10.4** If Complete
.1. The project is complete when the contractor has completed all contract bid items, change order work, and punch list work including the submission of all documentation.

**§ 9.11 Final Completion and Final Payment**

**§9.11.1** Application for Final Payment. After Contractor has, in the opinion of Architect, satisfactorily completed all corrections identified as defined in Article 9.11 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, marked-up record documents, wage affidavits, and other documents, Contractor may make application for final payment following the procedure for progress payments.

**§9.11.2** The final Application for Payment shall be accompanied (except as previously delivered) by:

.1 all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Article 11;

.2 consent of the surety, if any, to final payment;

.3 a list of all Claims against Owner that Contractor believes are unsettled; and

.4 complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

**§9.11.3** In lieu of the releases or waivers of Liens and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment 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.

**§9.11.4** Architect's Review of Application and Acceptance. If, on the basis of Architect's observation of the Work during construction and final inspection, and Architect's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, final payment is per the provisions of Article 9.12.8 Otherwise, Owner 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.

**§9.11.5** Final Completion Delayed. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Architect so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Owner, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Article 11, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Architect with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

**§9.11.6** Waiver of Claims. The making and acceptance of final payment will constitute:

.2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled

**§ 9.11.7** Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

Whenever, in the opinion of the Architect and Owner, the Contractor shall have completed the work in an acceptable manner and in accordance with the terms of the contract, the Architect and Owner shall make a final inspection of the work, and upon completion of the same, they shall certify to the Board of Public Works in writing as to said completion, and shall further certify as to the entire amount of every class of work performed and as to the value thereof. The Board of Public Works, upon receipt of said certificate, and its own inspection, when necessary, shall accept the work and approve final payment according to the terms of the Contract. In the event Common Council approval is necessary, the Board of Public Works shall make the required recommendations to the Common Council. Upon acceptance of the work, the Board of Public Works or Common Council shall order final payment to be made and shall notify the Contractor and the Surety of such acceptance. The action by the Owner and the Architect and Owner by which the Contractor is to be bound and the contract concluded according to the terms thereof, shall be evidenced by the aforesaid certificate and final payment, all prior certificates or estimates upon which payments may have been made being merely estimates and subject to correction in the final payment.

Whenever the term "final acceptance" is used throughout the contract, it shall be interpreted to mean that the requirement of this section shall be complied with.

**ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY**

**§ 10.1 Safety Precautions and Programs**

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

**§ 10.2 Safety of Persons and Property**

**§ 10.2.1** The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby; the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- **.2** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

**§10.2.2** The Contractor shall use every precaution to prevent damage or destruction of corporate or private property. The Contractor shall notify, in writing, the owners of all corporate or private property that interferes with the work and shall arrange with them for the disposition of such property. Contractor shall protect and carefully preserve all property marks until the Architect has witnessed or otherwise referenced the location or relocation.

**§10.2.3** The Contractor shall notify within reasonable time all corporate or private property owners and their lessees of any work to be undertaken by the Contractor which will be in close proximity to and which may cause damage to any footings, foundations, or any substructures, and advise all such owners and their lessees that they should take all necessary measures to fortify same.

**§10.2.4** The Contractor shall be responsible for the damage or destruction of property of any character resulting from neglect, misconduct or omission in the manner or the method of execution or the partial or complete failure in execution of the work or caused by defective work or the use of unsatisfactory materials, and such responsibility shall not be released until the work shall have been completed and the requirements of these specifications complied with.

**§10.2.5** Wherever public or private property is damaged or destroyed, the Contractor shall, at their own expense, restore such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding or replacing it as may be directed, or Contractor shall otherwise make good such damage or destruction in an acceptable manner. If Contractor fails to do so, the Architect may, after the expiration of a period of forty-eight (48) hours after giving notice to the Contractor in writing, proceed to repair, rebuild or otherwise restore such property as may be deemed necessary and deduct the cost of such restoration from the compensation due or which may become due the Contractor under this contract.

**§ 10.2.6** The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

**§ 10.2.7** The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

**§ 10.2.8** When the use of explosives is necessary for the prosecution of the work, the Contractor shall observe the utmost care not to endanger life and property. The Contractor shall not use explosives in the course of their work without the approval of the Board of Public Works and/or the Owner and/or Architect.

All blasting operations must conform to the State of Wisconsin Statutes, Wisconsin Industrial Commission Orders and City of Wauwatosa regulations therefore.

**§ 10.2.9** The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.2 and 10.2.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.2 and 10.2.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

**§ 10.2.10** The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

**§ 10.2.11** The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

**§ 10.2.12 Injury or Damage to Person or Property**
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

**§10.2.13 Storage of Materials, Equipment and Vehicles.** Materials shall be so stored as to insure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, shall be inspected prior to their use in the work and shall meet the requirements of the specifications at the time it is proposed to use them. Stored materials shall be located so as to facilitate prompt inspection. That portion of the public streets or public lands not required for public use or travel may upon approval of the Architect and Owner be used for storage purposes and for placing of the Contractor's plant and equipment, however, adequate storage space is not guaranteed and, additional space, if required, shall be provided by the Contractor at their own expense. The Contractor's vehicles, equipment and materials shall not be left on the street except when work operations are actually in progress, unless otherwise authorized by the Architect and Owner.

**§10.2.14 Laws to be Observed**. The Contractor shall at all times observe and comply with all laws, ordinances and regulations which in any manner affect the conduct of the work, and all such orders or decrees as exist at the present or which may be enacted later by bodies or tribunals having jurisdiction or authority over the work, and no plea of misunderstanding or ignorance thereof will be deemed an excuse or the cause of the Contractor sustaining damages by reason of the Contractor acting at their own peril due to such misunderstanding or ignorance. Contractor shall indemnify and save harmless the Owner and all its officers, agents, employees and servants against any claim or liability arising from or based on the violation of any law, ordinance, regulation, order or decree whether by the Contractor or the Contractor's employees.

.1 Vehicles hauling materials used in or about the work or the movement of vehicles or equipment over any public highway or street to the project, necessary for the prosecution of the work, shall be regulated in accordance with the provisions of all laws, ordinances and regulations.

.2 All scaffolding, walkways, runways, hoists and other temporary constructions shall comply with all pertinent requirements of all laws, ordinances and regulations.

**§10.2.15 Sanitary Provisions**. The Contractor and/or the Contractor's subcontractor's shall provide and maintain in a neat and sanitary condition such accommodation for their employees as may be necessary to comply with the requirements and regulations of the Wisconsin State Board of Health, City Ordinances, or of other authorities having jurisdiction, and shall commit no public nuisance.

**§ 10.3 Hazardous Materials and Substances**
**§ 10.3.1** The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or

polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

**§ 10.3.2** Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

**§ 10.3.3** To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

**§ 10.3.4** The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

**§ 10.3.5** The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

**§ 10.3.6** If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

**§ 10.4 Emergencies**

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

**ARTICLE 11 INSURANCE AND BONDS**

**§ 11.1 Contractor's Insurance and Bonds**

**§ 11.1.1** The Contractor and the Contractor's insurance company shall be held responsible for and shall save the Owner harmless from all liability for damages occasioned by the digging up, use or occupancy of the street, alley, highway, public grounds and private grounds, or which may result therefrom, or which may result in any way from the negligence or carelessness of the Contractor, their agents, employees or workmen; or by reason of the elements, unforeseen or unusual difficulties, obstructions, or obstacles encountered in the prosecution of the work; and they shall indemnify the Owner for and save it harmless from all claims and liabilities, actions and causes of action, and liens for materials furnished or labor performed in the construction or execution of the work, and from all costs, charges and expenses incurred in defending such suits or actions, and from and against all claims and liabilities for injury or damage to persons or property emanating from defective or careless work methods, or from and against all claims or liabilities for royalties, license fees, actions, suits, charges and expenses or damage from infringement for reason of the use of any invention or improvement in tools, equipment or plant or any process, device or combination of devices used in the construction of the work.

The Contractor shall not commence work under a contract until they have obtained all insurance required under this paragraph and has filed certificates thereof with the Owner, nor shall the Contractor allow a subcontractor to commence work until all similar insurance required has been so obtained and filed. Contractor shall be required to maintain insurance throughout the duration of the contract until final acceptance of the project.

A. WORKMEN'S COMPENSATION INSURANCE Statutory coverage as required by Chapter 102 of the Statutes of the State of Wisconsin, as revised, and all acts amendatory thereof and supplementary thereto, and for all employees of the Contractor. All subcontractors and suppliers shall furnish to the Contractor and the Owner evidence of similar insurance for all of their respective employees unless such employees are covered by the protection afforded by the Contractor.

B. COMPREHENSIVE GENERAL LIABILITY AND PROPERTY DAMAGE INSURANCE

1. COMPREHENSIVE GENERAL LIABILITY

The Contractor shall maintain during the life of this Contract, Comprehensive General Liability written in comprehensive form to protect the Contractor, and the Owner against all claims arising from injuries to members of the public or damage to property of others arising out of any act or omission of the Contractor or their agents, employees, or subcontractors. The policy shall be endorsed to include Notice of Cancellation Endorsement Form IL-7002 10-90 or equivalent endorsement language which is approved by the City Attorney. This endorsement shall be specifically reflected on the Certificate of Insurance form required by Section 504.18, *infra*, and a copy of said endorsement shall be provided to the Owner when available. In addition, this policy shall specifically insure the contractual liability assumed by the Contract.

The scope of this coverage shall also include the Personal Injury Hazards, including "a", "b", and "c". "a" includes false arrest, malicious prosecution, and un-willful detention or imprisonment. "b" includes libel, slander, and defamation of character. "c" includes wrongful eviction, invasion of privacy and wrongful entry. Employee exclusion shall be removed. In addition, coverage will include broad form property damage, host liquor liability, advertising injury, additional persons insured, extended bodily injury, and incidental medical malpractice.

Comprehensive general liability coverage shall contain no exclusions for explosion, collapse, or underground work (X, C, or U).

The contractor shall also provide completed operation and product liability coverage for the life of the Contract and maintain such coverage for a period of 1 year after final acceptance of the work by the Owner.

The liability limits shall not be less than $1,000,000 combined single limit per occurrence for personal injury, bodily injury and property damage if coverage written on 1973 I.S.O. form or $1,000,000. combined single limit per occurrence with $2,000,000. aggregate for personal injury, bodily injury or property damage if coverage is written on 1986 I.S.O. coverage form.

2. UMBRELLA/EXCESS LIABILITY

The Contractor shall maintain during the life of this Contract, Umbrella/Excess Liability coverage totaling $5,000,000. If primary comprehensive General Liability is written on a 1986 I.S.O. coverage form, Umbrella/Excess liability shall include a drop down provision to protect, on a primary basis, the contractor, and the Owner , in the case of exhaustion of the aggregate primary limits.

C. COMPREHENSIVE AUTOMOBILE LIABILITY AND PROPERTY DAMAGE

Operations of owner, hired and non-owned motor vehicles.

Bodily Injury $500,000 per person
$1,000,000 per occurrence Property Damage $500,000 per occurrence

The Contractor shall file with the Owner a certification of insurance containing a ten (10) day notice of cancellation.

NOTE: The required limits of liabilities may be obtained with primary liability policies or in combination with an umbrella excess third party liability policy.

D. ADDITIONAL INSUREDS All insurance coverages required pursuant to this contract shall name the following persons as additional insured parties:

The Owner and its boards, commissions, committees, authorities, employees, agencies and officers, voluntary associations, other units operating under the jurisdiction and within the appointment of its budget.

E. PROOF OF CARRIAGE OF INSURANCE

The Contractor shall furnish the Owner with satisfactory proof of carriage of the insurance required on the Certificate of Insurance form attached hereto. Insurance coverage shall be maintained throughout the duration of the project.

**§ 11.1.2** The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

.1 Performance Bond The Contractor shall execute a performance bond on the form provided herein in an amount at least equal to 100% of the full contract price, such bond to be executed by a surety company acceptable to the Owner. The performance bond shall serve as security for the faithful performance of this contract. In the event the surety takes over the work and project under the contract, the surety shall be bound by all the provisions of the contract.

.2 Labor and Material Bond The Contractor shall furnish a surety bond in an amount at least equal to 100% of the full contract price, such bond to be executed by a surety company acceptable to the Owner. The labor and material bond shall serve as security for the payment of all persons performing labor and all persons furnishing materials in connection with this contract.

.3 Premium Payment The premiums on the performance bond and labor and material bond shall be paid by the Contractor.

.4 All bonding companies and sureties issuing bonds and/or contract security shall be licensed to perform business in the State of Wisconsin.

**§11.1.3. Compliance with Section 71.80(16).** If Section 71.80(16) Wisconsin Statutes is applicable, Contractor hereby agrees to comply with the requirements of such Section. This Section is applicable to Contractors who are nonresidents of Wisconsin when total contract price exceeds $50,000.00.

**§11.1.4 Additional Security.** Should any surety upon the bond for performance of this contract become unacceptable to the Owner, the Contractor must promptly furnish such additional security as may be provided from time to time to protect the interests of the Owner and of persons supplying labor or materials in the prosecution of the work contemplated by this contract.

**§ 11.1.5** Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

**§ 11.1.6 Notice of Cancellation or Expiration of Contractor's Required Insurance.** Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

**§ 11.2 Owner's Insurance**
**§ 11.2.1** The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract

Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

**§ 11.2.2 Failure to Purchase Required Property Insurance.** If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

**§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance.** Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

**§ 11.3 Waivers of Subrogation**

**§ 11.3.1** The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

**§ 11.3.2** If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

**§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance.** The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

**§11.5 Adjustment and Settlement of Insured Loss**

**§ 11.5.1** A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and

Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

**§ 11.5.2** Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

**ARTICLE 12 UNCOVERING AND CORRECTION OF WORK**

**§ 12.1 Uncovering of Work**

**§ 12.1.1** If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

**§ 12.1.2** If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

**§ 12.2 Correction of Work**

**§ 12.2.1 Before Substantial Completion**

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

**§ 12.2.2 After Substantial Completion**

**§ 12.2.2.1** In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

**§12.2.2.2** Maintenance. The Contractor shall be required to repair at the Contractor's own expense, any faulty material or workmanship and any damage therefrom that may develop within a period of one year after the date of "Final Acceptance." The Contractor shall make such repairs to the entire satisfaction of the Architect and the Owner. The performance bond furnished with this contract shall remain in full force and effect until the expiration of the warranty period, and until any necessary repairs have been made to the entire satisfaction of the Owner .

**§ 12.2.2.3** The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

**§ 12.2.2.4** The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

**§ 12.2.3** The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

**§ 12.2.4** The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

**§ 12.2.5** Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

**§ 12.3 Acceptance of Nonconforming Work**
If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

**ARTICLE 13 MISCELLANEOUS PROVISIONS**
**§ 13.1 Governing Law**
The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

**§ 13.2 Successors and Assigns**
**§ 13.2.1** The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

**§ 13.2.2** The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

**§ 13.3 Rights and Remedies**
**§ 13.3.1** Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

**§ 13.3.2** No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

**§ 13.4 Tests and Inspections**
**§ 13.4.1** Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect

timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

**§ 13.4.2** If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

**§ 13.4.3** If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

**§ 13.4.4** Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

**§ 13.4.5** If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

**§ 13.4.6** Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

**§ 13.5 Interest**
Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

**§13.6 Personal Liability of Public Officials** In carrying out any of the provisions of this contract or in exercising any power or authority granted to the Contractor hereby, there shall be no personal liability upon the City Engineer or their authorized assistants, or any other Officials of Owner, it being understood that in such matters they act as agents and representatives of the Owner.

**§13.7 No Waiver of Legal Rights** The Owner shall not be precluded or estopped by any measurements, estimate or certificate made either before or after the completion and acceptance of the work and payment therefore, from showing the true amount and character of the work performed and materials furnished by the Contractor, or from showing that any measurement, estimate or certificate is untrue or incorrectly made, or that the work or materials do not conform in fact to the contract. The Owner shall not be precluded or estopped, notwithstanding any such measurement, estimate, certificate and payment in accordance therewith, from recovering from the Contractor and their sureties such damage as it may sustain by reasons of the Contractor's failure to comply with the terms of the contract. Neither the acceptance by the Board of Public Works, nor any representative of the Board of Public Works, not any payment for or acceptance of the whole or any part of the work, nor any extension of time, nor any possession taken by the Owner shall operate as a waiver of any portion of the contract or of any power herein reserved, or any right to damages herein provided. A waiver of breach of the contract shall not be held to be a waiver of any other or subsequent breach.

**§13.8 Covenant Against Contingent Fees** The Contractor warrants that they have not employed any person to solicit or secure this contract upon any agreement for a commission, percentage, brokerage or contingent fees. Breach of this warranty shall give the Owner the right to terminate the contract, or in its discretion to deduct from the contract price or consideration the amount of such commission, percentage, brokerage or contingent fees. This warranty shall not apply to commission payable to Contractors upon contracts or sales secured or made through bona fide established commercial or selling agencies maintained by the Contractor for purposes of securing business.

**§13.9 Officials Not to Benefit** No member of the Public Body of the Owner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

**§13.10 Other Contracts** The Owner may award other contracts for additional work and the Contractor shall fully cooperate with such Contractors and carefully fit work within the contract including additional work added to the contract to that provided under other contracts as may be directed by the Owner. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other Contractor.

**ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT**

**§ 14.1 Termination by the Contractor**

**§ 14.1.1** The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

**.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

**.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped; or

**.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents.

**.4**

**§ 14.1.2** The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

**§ 14.1.3** If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

**§ 14.1.4** If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

**§ 14.2 Termination by the Owner for Cause**

**§ 14.2.1** The Owner may terminate the Contract if the Contractor

**.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

**.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;

**.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or

**.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

**§ 14.2.2** When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

**.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

**.2** Accept assignment of subcontracts pursuant to Section 5.4; and

**.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

**§ 14.2.3** When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

**§ 14.2.4** If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

**§ 14.3 Suspension by the Owner for Convenience**

**§ 14.3.1** The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

**§ 14.3.2** The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

**.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

**.2** that an equitable adjustment is made or denied under another provision of the Contract.

**§ 14.4 Termination by the Owner for Convenience**

**§ 14.4.1** The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

**§ 14.4.2** Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

**.1** cease operations as directed by the Owner in the notice;

**.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

**.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

**§ 14.4.3** In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

**ARTICLE 15 CLAIMS AND DISPUTES**

**§ 15.1 Claims**

**§ 15.1.1 Definition**

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

**§ 15.1.2 Time Limits on Claims**

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

**§ 15.1.3 Notice of Claims**

**§15.1.3.1. Disputed Work.** If the Contractor is of the opinion that any work required, necessitated, or ordered, is contrary to the terms and provisions of this Contract, Contractor must promptly notify the Architect in writing, of their intentions with respect thereto, and request a final determination thereon. If the Architect determines that the work in question is contract work and not extra work, or that the order complained of is proper, the Architect will direct the Contractor to proceed and the Contractor shall promptly comply. In order, however, to reserve the Contractor's right to claim compensation for such work or damages resulting from such compliance, the Contractor must, within 5 days after receiving notice of the Architect's determination and direction, notify the Architect and Owner, in writing, that the work is being performed or that the determination and direction is being complied with, under protest. Failure of the Contractor so to notify shall be deemed as a waiver of claim for extra compensation or damages therefor.

Before final acceptance by the Owner, all matters of dispute must be adjusted to the mutual satisfaction of the parties thereto. Determinations and decisions, in case any question shall arise, shall constitute a condition precedent to the right of the Contractor to receive the money therefor, until the matter in question has been adjusted.

**§ 15.1.3.2** Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

**§ 15.1.3.3** Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

**§ 15.1.4 Continuing Contract Performance**
**§ 15.1.4.1** Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

**§ 15.1.4.2** The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

**§ 15.1.5 Claims for Additional Cost**
If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

**§ 15.1.6 Claims for Additional Time**
**§ 15.1.6.1** If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

**§ 15.1.6.2** If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

**§ 15.1.7 Waiver of Claims for Consequential Damages**
The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there

.3 for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

**§ 15.2 Initial Decision**

**§ 15.2.1** Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

**§ 15.2.2** The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

**§ 15.2.3** In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

**§ 15.2.4** If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

**§ 15.2.5** The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

**§ 15.2.6** Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

**§ 15.2.6.1** Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

**§ 15.2.7** In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

**§ 15.2.8** If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

**§ 15.3 Mediation**
**§ 15.3.1** Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

**§ 15.3.2** The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

**§ 15.3.3** Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

**§ 15.3.4** The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

**§ 15.4 Arbitration**
**§ 15.4.1** If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

**§ 15.4.1.1** A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

**§ 15.4.2** The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

**§ 15.4.3** The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

**§ 15.4.4 Consolidation or Joinder**
**§ 15.4.4.1** Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

**§ 15.4.4.2** Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not

constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

**§ 15.4.4.3** The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

## END OF SECTION 500

# SECTION 600
# SPECIAL PROVISIONS

## CONTRACT 24-60

These Special Provisions cover items, correction, deletions or additions to the General Contract Conditions, the Standard Specs, the State Specs, and the City Provisions, and take precedence over those other parts of those specifications which are in conflict herewith.

### 200.03 - TIME OF SUBSTANTIAL COMPLETION

**The substantial completion date for CONTRACT 24-60 MUELLNER BUILDING RENOVATION shall be October 25th, 2024.**

There will be no other extension of time and no extenuating circumstances, except perhaps an industry strike.

If the contractor does not complete the work on or before the date set forth above for CONTRACT 24-60 MUELLNER BUILDING RENOVATION or within the extra time allowed under a City granted time extension, the City will assess liquidated damages. The City will deduct Five Hundred Dollars ($500.00) for every calendar day that the work remains uncompleted from payments due the contractor. An entire calendar day will be assessed for any period of time within a calendar day that the work is not substantially complete beyond 12:01am.

### PLANS AND SPECIFICATIONS

A general description of the work along with the locations is contained in the Instructions to Bidders - Section 200. The plans consist of 59 plan sheets labeled MUELLNER BUILDING RENOVATION and specifications are included in this project manual.

### PERMITS AND FEES

All City permit fees will be waived as part of the project. The Contractor will still be responsible to procure any and all City permits needed to complete the work.

## SECTION 700 - CONTRACT

THIS contract made this _____ Day of _____ , 20 ___ by and between _____

hereinafter called the "Contractor" and the City of Wauwatosa, Wisconsin, hereinafter called the "City".

WITNESSETH, that the Contractor and the City for the consideration stated herein, agree as follows:

ARTICLE I. SCOPE OF WORK The Contractor shall perform everything required to be performed and shall provide and furnish all labor, material and equipment for the work of *Muellner Building Renovation project*

_____

_____

all in strict accordance with the Plans and Specifications, including any or all addenda prepared by the City of Wauwatosa and/or Kahler Slater under the direction of the Director of Public Works, acting and in these contract documents referred to as the Director of Public Works, which plans and specifications are made a part of this contract in strict compliance with the Contractor's proposal and the other contract documents herein mentioned which are a part of this contract and the Contractor shall do everything required by this contract and the other contract documents constituting a part hereof.

ARTICLE II. THE CONTRACT PRICE In consideration of the completion of the work described herein and in fulfillment of all stipulations of this contract to the satisfaction and acceptance of the Director of Public Works and the City, the City shall pay and the Contractor further agrees to receive and accept payment based on the prices hereto attached, which prices shall agree with those in the accepted Contractor's proposal as filed with the City of Wauwatosa, Wisconsin on the _____ day of _____ , 20 ___ , as full compensation subject to the additions or deductions provided therein, in current funds.

ARTICLE III. COMPONENT PARTS OF THE CONTRACT This contract consists of the following component parts, all of which are as fully a part of this contract as if herein set out verbatim, if not attached as if hereto attached.

1. Addenda (if applicable)
2. Special Provisions (Section 600)
3. Plans
4. General Conditions (Section 500; Section 501, if applicable)
5. Advertisement for Bids (Section 100)
6. Instructions to Bidders (Section 200)
7. Contractor's Proposal (Section 300)
8. Federal Funding Requirements & Minimum Wage Scale (Section 400)
9. Contract (Section 700)
10. All Other Specifications
11. Appendices and other documents intended to be incorporated into the contract
12. Bonds (Section 800)

In the event any provision in any of the above component parts of this contract conflicts with any provision in any other of the component parts, the provision in the component part first enumerated above shall govern over any component part which follows it numerically except as may otherwise be specifically stated.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in four original counterparts the day and year first above written.

(SEAL) _____
Contractor

_____
Address

Attest: _____

_____ By _____

_____ _____
Title Title

(SEAL)

*CITY OF WAUWATOSA*
Owner

Attest:

_____ By _____
City Clerk Mayor

_____
City Clerk

Provision has been made to pay the liability that will accrue under this contract up to the original amount thereof as specified in the Common Council resolution authorizing the same. Liability in excess of the original amount of this contract may accrue only after additional endorsement hereon by the City Comptroller as to provision of funds therefor.

_____ , 20 ___ _____
City Comptroller

Approved as to form _____ , 20 ___ .

_____
City Attorney

*CORPORATE CERTIFICATE

I, _____ certify that I am the _____ of the Corporation named as Contractor hereinabove; that _____ _____ , who signed the foregoing contract on behalf of the Contractor was then _____ of said Corporation; that said contract was duly signed for and in behalf of said Corporation by authority of its governing body, and is within the scope of its Corporate Powers.

_____ Corporate Seal

* If the Contractor is a corporation, the above Corporate Certificate should be executed.

If the contract is signed by the secretary of the Corporation, the above certificate should be executed by some other officer of the Corporation, under the corporate seal. In lieu of the foregoing certificate, there may be attached to the contract copies of so much of the records of the Corporation as will show the official character and authority of the officers signing, duly certified by the secretary or assistant secretary under the corporate seal to be true copies.

The full name and business address of the Contractor should be inserted and the contract should be signed with his official signature. Please have the names of the signing party or parties typewritten or printed under all signatures to the contract.

If the contractor should be operating as a partnership, each partner should sign the contract. If the contract is not signed by each partner, there should be attached to the contract a duly authenticated power of attorney evidencing the signer's (signers') authority to sign such contract for and in behalf of the partnership.

If the contractor is an individual, the trade name (if the contractor is operating under a trade name) should be indicated in the contract and the contract should be signed by such individual. If signed by one other than the contractor, there should be attached to the contract a duly authenticated power-of-attorney evidencing the signer's authority to execute such contract for and in behalf of the Contractor.

# CERTIFICATE OF INSURANCE

DATE (MM/DD/YYYY)

PRODUCER

INSURED

**THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.**

**COMPANIES AFFORDING COVERAGE**

COMPANY **A**

COMPANY **B**

COMPANY **C**

COMPANY **D**

## COVERAGES

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED, NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATION MAY BE ISSUED OR MAY PERTAIN, THE ISSUANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

| CO LTR | TYPE OF INSURANCE | POLICY NUMBER | POLICY EFFECTIVE DATE (MM/DD/YYYY) | POLICY EXPIRATION DATE (MM/DD/YYYY) | LIMITS | |
|---|---|---|---|---|---|---|
| | **GENERAL LIABILITY** | | | | GENERAL AGGREGATE | $ |
| | ☐ COMMERCIAL GENERAL LIABILITY | | | | PRODUCTS-COMP/OP AGG | $ |
| | ☐ CLAIMS MADE ☐ OCCUR | | | | PERSONAL & ADV INJURY | $ |
| | ☐ OWNER'S & CONTRACTOR'S PROT | | | | EACH OCCURRENCE | $ |
| | ☐ _____ | | | | FIRE DAMAGE (Any one fire) | $ |
| | ☐ | | | | MED EXP (Any one person) | $ |
| | **AUTOMOBILE LIABILITY** | | | | COMBINED SINGLE LIMIT | $ |
| | ☐ ANY AUTO | | | | | |
| | ☐ ALL OWNED AUTOS | | | | BODILY INJURY (Per Person) | $ |
| | ☐ SCHEDULED AUTOS | | | | | |
| | ☐ HIRED AUTOS | | | | BODILY INJURY (Per Accident) | $ |
| | ☐ NON-OWNED AUTOS | | | | | |
| | ☐ _____ | | | | PROPERTY DAMAGE | $ |
| | ☐ | | | | | |
| | **GARAGE LIABILITY** | | | | AUTO ONLY-EA ACCIDENT | $ |
| | ☐ ANY AUTO | | | | OTHER THAN AUTO ONLY: | |
| | ☐ _____ | | | | EACH ACCIDENT | $ |
| | ☐ | | | | AGGREGATE | $ |
| | **EXCESS LIABILITY** | | | | EACH OCCURRENCE | $ |
| | ☐ UMBRELLA FORM | | | | AGGREGATE | $ |
| | ☐ OTHER THAN UMBRELLA FORM | | | | | $ |
| | **WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY** | | | | ☐ STATUTORY LIMITS | $ |
| | THE PROPRIETOR/ PARTNERS/EXECUTIVE OFFICERS ARE: ☐ INCL ☐ EXCL | | | | EACH ACCIDENT | $ |
| | | | | | DISEASE-POLICY LIMIT | $ |
| | | | | | DISEASE-EACH EMPLOYEE | $ |
| | **OTHER** | | | | | $ |
| | | | | | | $ |
| | | | | | | $ |

**DESCRIPTION OF OPERATIONS/LOCATION/VEHICLES/SPECIAL ITEMS**

## CERTIFICATE HOLDER

*City of Wauwatosa*
*7725 W. North Avenue*
*Wauwatosa, WI 53213*

## CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING COMPANY WILL MAIL 10 DAYS WRITTEN NOTICE TO THE CITY OF WAUWATOSA.

AUTHORIZED REPRESENTATIVE:

_____

CERTIFICATION OF COMPLIANCE WITH UNEMPLOYMENT INSURANCE AND SOCIAL SECURITY ACT REQUIREMENTS

The Contractor hereby certifies that he has heretofore complied and will during the progress of the work, comply with the Wisconsin Unemployment Insurance Act and will hold the City harmless from any liability for benefits under such Act or Acts by reason of discontinuance by the Contractor of the employment of any person engaged by the Contractor upon the work. The Contractor also hereby certifies that he will during the progress of the work comply with the Federal Social Security Act and will hold the City harmless from any Social Security payments and provisions required by such Act respecting his or his subcontractors' employees.

_____
Contractor Name

_____
Contractor Signature

_____
Date

Accepted by City:

_____
City Attorney

_____
Date

## SECTION 800 - BONDS
## BID BOND

KNOW ALL MEN BY THESE PRESENTS, THAT we _____

_____

(hereinafter called the Principal) and _____

_____
(hereinafter called the Surety), A corporation chartered and existing under the laws of the State of _____, with its principal offices in the City of _____, and authorized to do business in Wauwatosa, Wisconsin, in the full and just sum of _____ _____ Dollars ($_____) good and lawful money of the United States of America, to be paid upon demand of the CITY OF WAUWATOSA, WISCONSIN, to which payment, well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators and assigns, jointly and severally and firmly by these presents.

WHEREAS, The Principal is about to submit, or has submitted to the City of Wauwatosa, Wisconsin, a proposal for furnishing all labor, materials, equipment and incidentals necessary to _____
_____
_____ and;

WHEREAS, The Principal desires to file this bond in accordance with law, in lieu of a certified bidder's check otherwise required to accompany this proposal.

NOW, THEREFORE: The conditions of this obligation are such that if the Proposal is accepted, the Principal shall, within ten days after the date of receipt of a written notice of award of contract, execute a contract in accordance with the Proposal and upon the terms, conditions, and price(s) set forth therein, of the form and manner required by the City of Wauwatosa, Wisconsin and execute a sufficient and satisfactory contract performance bond payable to the City of Wauwatosa, Wisconsin, in an amount of One Hundred Percent (100%) of the total Contract price, in form and with security satisfactory to said City, then this obligation to be void; otherwise to be and remain in full force and virtue in law; and the Surety shall, upon failure of the Principal to comply with any or all of the foregoing requirements within the time specified above, immediately pay to the aforesaid City, upon demand, the amount hereof in good and lawful money of the United States of American, not as a penalty but as liquidated damages.

IN TESTIMONY THEREOF, the Principal and Surety have caused these presents to be duly signed and sealed this _____ day of _____ 20 ___.

_____

Principal

By _____

(Seal)

_____

Surety

_____

(Seal)

Countersigned _____

Local Resident Producing Agent for _____

_____

(Note: This form of bond must be executed after the award of the contract.)

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, That we, _____
_____
_____ as Principal, and _____
_____
as Surety, are held and firmly bound unto the City of Wauwatosa, 7725 W. North Avenue, Wauwatosa, Wisconsin 53213, hereinafter called the City, in the penal sum of _____
_____Dollars, ($_____)
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, successors and assigns, jointly and severally, firmly by these presents.

The condition of this Obligation is such, that whereas the principal has executed the attached Agreement dated _____
_____

Now, Therefore, if the attached agreement is executed on behalf of the City and if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms and conditions of the said agreement, and any and all duly authorized modifications of the said agreement that may hereafter be made and shall pay to each and every person or party entitled thereto all the claims for work or labor performed or materials furnished, including premiums for Worker's Compensation Insurance, for or in or about or under such agreement as provided in Section 779.14 and 779.15 of the Wisconsin Statutes, and any such authorized extension or modification of said agreement, then this obligation to be void, otherwise to remain in full force and virtue.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the agreement or to work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligations on this bond, it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the agreement to the work or to the specifications.

IN WITNESS WHEREOF the above-bounden parties have executed this instrument, in _____ original counterparts, under their several seals this _____ day of _____, 20___, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

In presence of:

| | |
|---|---|
| _____ | _____(SEAL)<br>(Individual Principal) |
| _____ | _____<br>(Business Address) |
| _____ | _____(SEAL) |
| _____ | _____<br>(Business Address) |

Attest:

_____
(Corporate Principal)

_____
(Business Address)

_____ By _____(Affix Corporate Seal)

Attest:

_____

_____
(Corporate Surety)

_____
(Business Address)

_____ By _____(Affix Corporate Seal)

_____

Approved _____, 20 ___.

_____

_____Mayor
(Title)

NOTE: The Bond must be approved and the approval dated in every case; refer to Section 779.14 and 779.15 Wisconsin Statutes. The title of the person signing must be indicated.

# LABOR & MATERIAL PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS:

That _____
(Here insert full name and address or legal title of Contractor)

_____
as Principal, hereinafter called Principal, and _____

_____
(Here insert full name and address or legal title of surety)

as Surety, hereinafter called Surety, are held and firmly bound unto the City of Wauwatosa, 7725 West North Avenue, Wauwatosa, Wisconsin 53213, as Obligee, hereinafter called City for the use and benefit of claimants as hereinbelow defined, in the amount of _____
_____ Dollars (_____),
for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Principal has by written agreement dated _____,
20 __, entered into a contract with City for _____

_____
(Here insert full name, address and description of project)
in accordance with Drawings and Specifications prepared by _____

_____
(Here insert full name and address or legal title of Director of Public Works)
which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor, material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions.

1. A claimant is defined as one having a direct contract with the Principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use, in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above name Principal and Surety hereby jointly and severally agree with the City that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as may be justly due claimant, and have execution thereon. The City shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:
a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: The Principal, the City, or the Surety above named, within ninety (90) days after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail, postage prepaid, in an envelope addressed to the Principal, City or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the State in which the aforesaid project is located, save that such service need not be made by a public officer.

b) After the expiration of one (1) year following the date on which Principal ceased work on said Contract or after the expiration of one (1) year following the date of Substantial Completion of the Project, whichever is later, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the State in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment of payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this _____ day of _____, 20 ___.

_____
(Principal) (Seal)

_____ By _____
(Witness) (Title)

_____
(Surety) (Seal)

_____ By _____
(Witness) (Attorney-in-Fact)

AFFIDAVIT

(To be attached to all contracts)

STATE OF WISCONSIN)
)SS.
COUNTY )

_____ being first duly sworn on oath deposes and says he is _____

_____(Attorney-in-fact or agent) of

_____(Bonding Company)

surety on the attached contract number _____ executed by

_____ (Contractor).

Affiant further deposes and says that no officer, official or employee of the City of Wauwatosa has any interest directly or indirectly, or is receiving any premium, commission fee or other thing of value on account of the same or furnishing of the bond, undertaking or contract of indemnity, guaranty, or suretyship in connection with the above mentioned contract.

Signed _____

Subscribed and sworn to before me

This _____ day of _____, A.D.; 20 ____.

_____ (Notary Public)

_____ County, Wisconsin

My Commission expires _____.

## SECTION 01 1000 - SUMMARY

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Multiple Work Packages.
5. Work under Owner's separate contracts.
6. Owner-furnished/Contractor-installed (OFCI) products.
7. Contractor's use of site and premises.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and Drawing conventions.
11. Miscellaneous provisions.

B. Related Requirements:
1. Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.
2. Section 01 5000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
3. Section 01 7300 "Execution" for coordination of Owner-installed products.

1.2 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.3 PROJECT INFORMATION

A. Project Identification: Muellner Building Renovation, 223010.00 .
1. Project Location: 7300 W Chestnut Street. Wauwatosa, WI 53213

B. Owner: City of Wauwatosa – Public Works Department, 11100 W. Walnut Rd. Wauwatosa, WI 53226.

C. Architect:
1. Kahler Slater, Inc.
2. 790 N. Water Street, Suite 1700
3. Milwaukee, Wisconsin 53202

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:
1. MEPFP Engineer:
2. Ring & DuChateau LLP
3. 17400 W. Capitol Drive
4. Brookfield, Wisconsin 53045
5. Structural Engineer:
6. Reyn Engineering
7. 131 W Seebooth, Suite 220
8. Milwaukee, Wisconsin
9. Ice Consultant:
10. B32 Engineering Group, Inc.

E. Web-Based Project Management Software: Project software, administered by Architect, will be used for purposes of managing communication and documents during the construction stage.
   1. See Section 01 3100 "Project Management and Coordination." for requirements for using web-based Project software.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
   1. The Wauwatosa Muellner Building Renovation Project is a selective exterior and interior renovation of the Muellner Building. The existing building occupancy (A-3) and construction type will remain unchanged as part of the Project, and existing occupant loads will be maintained. The exterior renovation scope for the Project includes full exterior window replacement, selective exterior door replacement and various other exterior improvements. The interior renovation scope includes selective demolition, various finish upgrades, minor space reconfigurations, and selective interior door and storefront replacement. The interior scope also includes the full demolition and replacement of the existing curling ice slab and piping system. The Project scope includes electrical system upgrades, selective lighting fixture replacement, a new dehumidification unit, split system unit replacement, selective fire protection upgrades and replacement, and new plumbing fixtures and other Work indicated in the Contract Documents. The Building will also undergo a roof replacement and solar PV installation concurrently with this Project. The roof replacement and solar PV installation in not in the scope of this Project, but coordination between the two Projects will be required.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

1.5 WORK UNDER OWNER'S SEPARATE CONTRACTS

A. Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.

B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract. Coordination of work, including but not limited to, coordination of roof openings, solar PV structure and electrical connections, etc. will be required between this Contract and the following separate contracts.
   1. Roofing Work: To City Roofing Contractor for roof replacement, not shown on the drawings.
   2. Solar PV Work: To City Electrical Contractor for roof mounted photovoltaic panels, not shown on the drawings.

1.6 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
   1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
   2. Provide for delivery of Owner-furnished products to Project site.
   3. Upon delivery, inspect, with Contractor present, delivered items.

      a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

   4. Obtain manufacturer's inspections, service, and warranties.
   5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:
   1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.

2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

C. Owner-Furnished/Contractor-Installed (OFCI) Products:
1. Dehumidification Unit.
2. Bar top in Riverview Room.
3. As indicated on Drawings.

## 1.7 CONTRACTOR'S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

C. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

## 1.8 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.
1. Comply with requirements of authorities having jurisdiction for limitations on work hours, noise, utility shutdowns, use of public streets, and other disruptions, unless otherwise indicated.

B. On-Site Work Hours: Limit work to between 7:00 a.m. to 9:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
1. Weekend Hours: As determined by the Owner.
2. Early Morning Hours: As determined by the Owner.
3. Hours for Utility Shutdowns: As determined by the Owner.
4. Hours for Core Drilling, Jack Hammering, and Similar Noisy Activities: As determined by the Owner.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
1. Assign one individual responsibility for coordination, sequencing, and performance of shutdowns.
2. Notify Owner not less than three days in advance of proposed utility interruptions.
3. Obtain Owner's written permission before proceeding with utility interruptions.
4. Planned service shutdowns shall be performed during periods of minimum usage. In some cases this may require work outside of normal work hours; schedule and perform such work at no additional cost to Owner.

a. Perform the work so that service will be shutdown for the minimal amount of time possible; cooperate with the Owner to reduce quantity of service interruptions.

D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
1. Notify Owner not less than three days in advance of proposed disruptive operations.

2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Hot Processes: Hot processes include welding, flame cutting, and any processes that generate large amounts of sparks, heat, or smoke, or create a potential for fire. Hot processes conducted within or adjacent to the existing building shall be coordinated with Owner.
1. Notify Owner not less than three days in advance of proposed hot process operations.
2. Obtain Owner's written permission before proceeding with hot process operations.
3. Do not use hot processes 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 hot process operations. Maintain portable fire-suppression devices during hot process operations.
4. Maintain fire watch during and for at least 1 hour after hot process operations.
5. Maintain adequate ventilation when using cutting torches.

F. Traffic Disruptions: Coordinate operations that may result in traffic interruptions and detours disruptive to Owner occupancy with Owner.
1. Notify Owner not less than three days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

G. Existing Building Security: Contractor will be issued keys as necessary for access to areas of the building; Contractor will be held responsible for security of the keys and return them when no longer needed.
1. Contractor will be held responsible for cost of re-keying if keys are lost or compromised.

H. Attire: Verify attire with Owner for Contractor personnel in particular areas of Project site, such as surgical suites.

I. Smoking and Controlled Substance Restrictions: Use of tobacco products including electronic vapor cigarettes, alcoholic beverages, and other controlled substances on Owner's property is not permitted.
1. Nonsmoking Building: Smoking is not permitted on the Project site.

J. Other Restricted Items: The following items are not permitted within the building:
1. Tobacco products of any kind.
2. Electronic vapor cigarettes.
3. Sunflower seeds.
4. Shelled nuts, tree nuts, or peanuts of any kind.
5. Items similar to those listed above.

K. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to wear identification tags at all times.

L. Employee Screening: Comply with Owner's requirements for health, drug and background screening of Contractor personnel working on Project site.
1. Maintain list of approved screened personnel with Owner's representative.

## 1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Correlation of Documents:
1. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
2. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

## DOCUMENT 01 1013 – SCOPE DOCUMENTS DEFINITION

### PART 1 - GENERAL

1.1 Drawings and general provisions of the Contract, including General Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SCOPE DOCUMENTS

A. The Contract Documents indicate the general scope of the Project in terms of architectural design concept, building dimensions, major architectural elements, civil design concept, landscape design concept and the types of structural, mechanical, plumbing, fire protection, and electrical systems, without limitation. The Contract Documents are not, however, the final Drawings and Specifications for the Project. The Contract Documents may be added to, changed and modified after execution of the Contract and during the Construction Phase. The Contract Documents do not necessarily indicate or describe all Work required for the Project. The approved Contract Documents, together with any modifications made thereto during construction, will be the final Drawings and Specifications for the Project.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION (Not Used)

**END OF DOCUMENT**

## SECTION 01 2100 - ALLOWANCES

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Lump-sum allowances.

1.2 DEFINITIONS

A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.3 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.6 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.

B. Submit claims for increased costs due to a change in the scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Lump-Sum Allowance: Include the sum of $XX,000.00 for inspectinging, repairing, painting, and sealing the decorative cupola.

1. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

A. Allowance No. 2: Lump-Sum Allowance: Include the sum of $XX,000.00 for replacement of deteriorated exterior wood trim.

1. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.

**END OF SECTION**

## SECTION 01 2500 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 01 2100 "Allowances" for products selected under an allowance.
2. Section 01 6000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use CSI Form 13.1A (Document 01 2500.13 “Substitution Request Form”).
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Finish products, including but not limited to stone, brick, glazing, plastic laminates, carpeting, and wallcoverings, shall be substantially similar in appearance, including color, texture, and sheen. Final determination of acceptability of appearance shall be made by the Architect.
g. Certificates and qualification data, where applicable or requested.

h. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
i. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
j. Research reports evidencing compliance with building code in effect for Project, from ICC-ES or another organization acceptable to Architect and authorities having jurisdiction.
k. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
l. Cost information, including a proposal of change, if any, in the Contract Sum.
m. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
n. Contractor's waiver of rights to claims for additional payment, changes, or time that may subsequently become necessary including, but not limited to, failure of proposed substitution to produce indicated results or unforeseen impact of proposed substitution on additional elements and systems.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Bulletin, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

## 1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

## 1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

## 1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.

h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

# SUBSTITUTION REQUEST

PROJECT: _____

SUBSTITUTION REQUEST NUMBER: _____

FROM: _____

TO: _____

DATE: _____

A/E PROJECT NUMBER: _____

RE: _____

CONTRACT FOR: _____

SPECIFICATION TITLE: _____

DESCRIPTION: _____

SECTION: _____ PAGE: _____

ARTICLE/PARAGRAPH: _____

PROPOSED SUBSTITUTUION: _____

MANUFACTURER: _____ ADDRESS: _____ PHONE: _____

TRADE NAME: _____ MODEL NO.: _____

INTALLER: _____ ADDRESS: _____ PHONE: _____

HISTORY: ☐ New Product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old

DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED PRODUCT: _____

☐ Point-by-point comparative data attached — REQUIRED BY A/E

REASON FOR NOT PROVIDING SPECIFIED ITEM: _____

SIMILAR INSTALLATION:

PROJECT: _____ ARCHITECT: _____

ADDRESS: _____ OWNER: _____

DATE INSTALLED: _____

PROPOSED SUBSTITUTION AFFECTS OTHER PARTS OF WORK: ☐ No ☐ Yes; explain _____

SAVINGS TO OWNER FOR ACCEPTING SUBSTITUTION:

PROPOSED SUBSTITUTION CHANGES CONTRACT TIME: ☐ No ☐ Yes ☐[Add] ☐[Deduct] _____ days.

SUPPORTING DATA ATTACHED: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

CONTINUE ON NEXT PAGE



© 2020 The Construction Specifications Institute (CSI)

# SUBSTITUTION REQUEST

## Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

**SUBMITTED BY:** _____

**SIGNED BY:** _____

**FIRM:** _____

**ADDRESS:** _____

**TELEPHONE:** _____

☐ **Attachments**

**A/E's REVIEW AND RECOMMENDATION:**

☐ Approve Substitution—Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.

☐ Approve Substitution as noted—Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.

☐ Reject Substitution—Use specified materials.

☐ Substitution Request received too late—Use specified materials.

**SIGNED BY:** **DATE:**

**OWNER'S REVIEW AND ACTION:**

☐ Substitution approved—Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures. Prepare Change Order

☐ Substitution approved as noted—Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures. Prepare Change Order.

☐ Substitution rejected—Use specified materials.

**SIGNED BY:** **DATE:**

**ADDITIONAL COMMENTS:** ☐ **Contractor** ☐ **Subcontractor** ☐ **Supplier** ☐ **Manufacturer** ☐ **A/E**



© 2020 The Construction Specifications Institute (CSI)

## SECTION 01 2613 - REQUESTS FOR INFORMATION

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Administrative provisions for the following:

a. Requests for Information (RFIs).

B. Related Requirements:

1. Section 01 3100 "Project Management and Coordination" for web-based Project management software.

1.2 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Architect’s Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form via web-based Project management software with substantially the same content as indicated above.

1. Attachments shall be electronic files in PDF format.
2. Submit RFIs via Section 01 3300 “Submittal Procedures”.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

a. Requests for approval of submittals.
b. Requests for approval of substitutions.
c. Requests for approval of Contractor's means and methods.
d. Requests for coordination information already indicated in the Contract Documents.
e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 2600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. RFI Log: RFI Log will be maintained through web-based Project Management software indicated in Section 01 3100 "Project Management and Coordination".

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Bulletin, and Proposal Request, as appropriate.

G. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

## SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Web-based Project management software.
4. Project meetings.

B. Related Requirements:

1. Section 01 2613 “Requests for Information”.
2. Section 01 7300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 01 7700 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

A. BIM: Building Information Modeling.

1.3 INFORMATIONAL SUBMITTALS

A. Media Distribution Indemnification Form: The Owner and Contractor shall each submit for the Architect’s record a fully executed Media Distribution Indemnification Form (Document 01 3129 in this manual).

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, office and cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, in web-based Project management software directory, and in prominent location in built facility. Keep list current at all times.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
h. Dimensions of structure, equipment, and fixtures shall be based on reviewed Shop Drawings.

B. Coordination Drawing Organization: Coordination drawings shall include the following:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, equipment supports, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Interior Elevations: Provide coordination drawings for all interior elevations requiring coordinated and precise placement of architectural features and mechanical, plumbing, fire-protection, fire-

alarm, and electrical equipment. This includes, but is not limited to receptacles, wire mold, furnishings, artwork, and Owner-furnished IT peripherals and equipment.

4. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
5. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
6. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
7. Equipment Support Systems: Indicate locations of anchorage, supports, and bracing of all equipment support systems.
8. Cold-Formed Metal Framing: Indicate locations of support and bracing of cold-formed metal framing systems, including non-structural metal framing.
9. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts, and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.
    d. Access panel sizes and locations.

10. Electrical Work: Show the following:

    a. Runs and supports of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.
    e. Access panel sizes and locations.

11. Fire-Protection System: Show the following:

    a. Locations of standpipes, mains piping, branch lines, supports, pipe drops, and sprinkler heads.
    b. Access panel sizes and locations.

12. Firestopping: Locations of penetrations of fire-rated construction shall be coordinated with and approved by the firestopping installer to ensure the requirements for all firestopping assemblies comply with the specified tested firestopping assemblies.
13. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 3300 "Submittal Procedures."

C. Coordination Drawing Process: Prepare coordination drawings in the following manner:

1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
7. Contractor shall perform the final coordination review. Perform three-dimensional component conflict analysis as part of preparation of coordination drawings. Resolve component conflicts prior

to submittal to Architect. Indicate where conflict resolution requires modification of design requirements by Architect.

8. Virtual clashes, conflicts, clearance problems, and other construction logistic issues shall be resolved and submitted for review prior to commencing associated construction activities.
9. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.
10. Architect's Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

D. Coordination Digital Data Files: Prepare digital coordination drawing files.

1. Design Model: A Design Model is an approximate representation of a project developed from generic content and assumptions. The Design Model indicates design intent and is furnished to aid in the preparation of coordination drawings.

   a. Architect will furnish Contractor one Design Model and one Portable Data (PDF) Format set of drawings for use in preparing coordination models and drawings.
   b. Architect makes no representations as to the accuracy or completeness of the Design Model as it relates to the Drawings.
   c. Contractor shall account for any necessary system components and details required to provide fully coordinated, complete, and operational systems at no additional cost to the Owner.
   d. Design Model format: Autodesk Revit (.rvt); verify exact version with Architect.
   e. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual, Document 01 3129 "Media Distribution Indemnification Form".

2. Coordination Drawing Submittal: Submit coordination drawings according to requirements in Section 01 3300 "Submittal Procedures."

## 1.6 WEB-BASED PROJECT MANAGEMENT SOFTWARE

A. Architect's Web-Based Project Management Software (Newforma): Use Architect's Web-Based Project Management Software for purposes of hosting and managing project communication and documentation until Final Completion.

1. Exchange and transfer of construction administration documentation shall be performed electronically utilizing the Newforma Project Center Project information management software operated by Kahler Slater and accessed via the Internet.
2. Newforma software shall be used for purposes of organizing and accessing Project information, including but not limited to, Submittals and RFIs, and sharing and tracking Project documents with external Project team members.

   a. Submittal transmission other than by electronic means or use of other types of Project information management software is prohibited except as follows:

      1) Samples: Refer to Section 01 3300 "Submittal Procedures".

3. Use of the Web-enabled Newforma Info Exchange Server, accessible by internal Project team members (Kahler Slater staff) and external Project team members (consultants, Construction Manager, General Contractor, Subcontractors, etc.), shall permit exchange of files by means of a Web browser. The Info Exchange activity center shall be used to transfer files, log and track them, and access the Info Exchange website. It shall provide e-mail notifications, reminders, automated transfer expiration, and history log (audit trail) for posted file transfers. The status of each file transfer can be tracked.
4. By means of the Info Exchange activity center, the Contractor shall transfer files, logged as either Submittals or RFIs, to be downloaded by Kahler Slater.

a. Contractor shall provide each Submittal to Kahler Slater in electronic format using Newforma software. Providing paper copies that require scanning by Kahler Slater is prohibited.

5. By means of the Info Exchange Server internal and external Project team members shall use a Web browser to view and download uploaded file transfers, upload file transfers, and view a log containing incoming and outgoing file transfers.
6. Submittals: By means of the Project Submittals activity center, submittal file transfers may be received, filed, reviewed, logged, and tracked electronically. Other functions shall be as follows:

   a. Record an exchange of files related to a specified construction requirement.
   b. Track each submittal's action status.
   c. Set action to "Approved," "Rejected," "Revise and Resubmit," etcetera.
   d. Manage the submittal log (sort by due date, Specification Section number, etc.), identify submittals requiring attention, and create reports.
   e. Forward submittals to internal or external team members for review and record reviewer responses.

7. RFIs: By means of the Project RFIs activity center, RFI file transfers may be received, filed, reviewed, logged, and tracked electronically. Other functions shall be as follows:

   a. Record a question and track each RFI's action status.
   b. Record answers to RFIs and respond to the author.
   c. Manage the RFI log (sort and track by due date, received date, discipline, keywords, etc.), identify RFIs requiring attention, and create reports.

## 1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

   a. Responsibilities and personnel assignments.
   b. Tentative construction schedule.
   c. Phasing.
   d. Critical work sequencing and long lead items.
   e. Designation of key personnel and their duties.
   f. Lines of communications.
   g. Use of web-based Project management software.
   h. Procedures for processing field decisions and Change Orders.
   i. Procedures for RFIs.
   j. Procedures for testing and inspecting.
   k. Procedures for processing Applications for Payment.

l. Distribution of the Contract Documents.
m. Submittal procedures.
n. Preparation of Record Documents.
o. Use of the premises and existing building.
p. Work restrictions.
q. Working hours.
r. Owner's occupancy requirements.
s. Responsibility for temporary facilities and controls.
t. Procedures for moisture and mold control.
u. Procedures for disruptions and shutdowns.
v. Construction waste management and recycling.
w. Parking availability.
x. Office, work, and storage areas.
y. Equipment deliveries and priorities.
z. First aid.
aa. Security.
bb. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

1. Attendees: Contractor and its superintendent; installer, and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Possible conflicts.
i. Compatibility requirements.
j. Time schedules.
k. Weather limitations.
l. Manufacturer's written instructions.
m. Warranty requirements.
n. Compatibility of materials.
o. Acceptability of substrates.
p. Temporary facilities and controls.
q. Space and access limitations.
r. Regulations of authorities having jurisdiction.
s. Testing and inspecting requirements.
t. Installation procedures.
u. Coordination with other work.
v. Required performance results.
w. Protection of adjacent work.
x. Protection of construction and personnel.
y. Protection of in-progress and completed work.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at regular intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Contractor and its superintendent, Owner and Architect, each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of coordination drawing conflicts.
        4) Status of submittals.
        5) Deliveries.
        6) Off-site fabrication.
        7) Access.
        8) Site use.
        9) Temporary facilities and controls.
        10) Progress cleaning.
        11) Quality and work standards.
        12) Status of correction of deficient items.
        13) Field observations.
        14) Status of RFIs.
        15) Status of Proposal Requests.
        16) Pending changes.
        17) Status of Change Orders.
        18) Pending claims and disputes.
        19) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

E. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

    a. Advise Owner and Architect of scheduled meeting dates.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Schedule Updating: Revise construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
   b. Review present and future needs of each contractor present, including the following:

      1) Interface requirements.
      2) Sequence of operations.
      3) Resolution of coordination drawing conflicts.
      4) Status of submittals.
      5) Deliveries.
      6) Off-site fabrication.
      7) Access.
      8) Site use.
      9) Temporary facilities and controls.
      10) Work hours.
      11) Hazards and risks.
      12) Progress cleaning.
      13) Quality and work standards.
      14) Status of RFIs.
      15) Proposal Requests.
      16) Change Orders.
      17) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

F. Building Enclosure Conference: Architect will conduct a building enclosure preinstallation conference at Project site before beginning of building envelope construction.

1. Attendees: In addition to representatives of Contractor and its superintendent, Owner, and Architect, each subcontractor, supplier, and other entity involved in or affected by the building enclosure and its coordination or integration with other materials and installations that have preceded or will follow, shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Schedule: Submittals for building enclosure elements shall be complete prior to meeting.
3. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

   a. Submittals.
   b. Review of mockups.
   c. Sequence of installation.
   d. Possible conflicts.
   e. Weather limitations.
   f. Manufacturer's written instructions.
   g. Protection of adjacent work.
   h. Compatibility of materials.
   i. Acceptability of substrates.
   j. Space and access limitations.
   k. Installation procedures.
   l. Coordination with other work.
   m. Required performance results.
   n. Protection and repairs.
   o. Exposure limitations.
   p. Field quality control testing.

4. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

5. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
6. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

G. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

    a. Preparation of Record Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Procedures for completing and archiving web-based Project management software site data files.
    d. Submittal of written warranties.
    e. Requirements for preparing operations and maintenance data.
    f. Requirements for delivery of material samples, attic stock, and spare parts.
    g. Requirements for demonstration and training.
    h. Preparation of Contractor's punch list.
    i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    j. Submittal procedures.
    k. Owner's partial occupancy requirements.
    l. Installation of Owner's furniture, fixtures, and equipment.
    m. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

## DOCUMENT 01 3129 - MEDIA DISTRIBUTION INDEMNIFICATION FORM

**Project: Muellner Building Renovation**
**Architect: Kahler Slater, Inc.**
**KS Project Number: 223010.00**
**Recipient Organization: _____**

**Use of Architect's Instruments of Service**

A. Drawings, Specifications, Electronic Media (such as CADD files, Building Information Model (BIM) files, word processing files, etc.) and other documents prepared by the Architect, defined as "Architect, Architect's Employees, and Architect's Consultants," for this Project are instruments of the Architect's service for use solely with respect to this Project. Unless otherwise indicated, the Architect shall be deemed the author of these documents and shall retain all common law, statutory, and other reserved rights, including the copyright.

1. The Recipient shall be permitted to retain one record set of the Architect's Instruments of Service for information and reference in connection with the Owner's use and occupancy of this Project.
2. The Architect's Instruments of Service shall not be used by the Recipient or other parties on other projects, for additions to this Project, or for completion of this Project under separate contract, except by agreement in writing and with appropriate compensation to the Architect.

B. Submittal and distribution of the Architect's Instruments of Service to meet official regulatory requirements and for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's copyrights and other reserved rights.

C. If the Recipient utilizes the Architect's Instruments of Service for the Recipient's use according to Paragraph A above, the Recipient shall fully remove the Architect's name, stamp, and seal from such Architect's Instruments of Service and shall indemnify, defend, and hold the Architect, the Architect's officers, directors, agents, and employees harmless from and against any and all costs, damages, expenses, liabilities and losses arising out of such use by the Recipient and any other party. The Recipient acknowledges that the Architect shall have no liability for use of the Architect's Instruments of Service by any party other than the Architect.

D. All copyrighted information remains property of Kahler Slater, Inc., and may not be copied or utilized without expressed written permission by an officer of Kahler Slater, Inc. or as expressly allowed by contractual arrangement.

E. The Recipient shall use the Architect's Instruments of Service in accordance with protocols for transmission, format, and use agreed upon with the Architect. The Recipient hereby agrees to view the electronic data using the same version of software used by the Architect to create the data to ensure that the data will be accurately read and interpreted.

F. The Recipient acknowledges that Electronic Media, if converted from one file type to another (such as exporting a Revit model to CAD files), or if read by or interacting with another software version or type, may have some elements altered, eliminated, or may change the appearance (such as line weights, fonts, and font size). Recipient agrees that this Electronic Media may be incomplete or inaccurate. Some file types may not be compatible with CADD or other software except by conversion.

G. This agreement allows use of the Architect's Instruments of Service solely for the Project indicated on this form.

**APPROVED AND AGREED TO BY RECIPIENT OF ARCHITECT'S INSTRUMENTS OF SERVICE**:

_____ _____
Recipient Organization Legal Name Date

_____
Print Name

_____
Signature

_____
Title

©2023 KAHLER SLATER, INC.

**END OF DOCUMENT**

## SECTION 01 3300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

B. Related Requirements:
1. Section 01 3100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project management software.
2. Section 01 4000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
3. Section 01 7700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a list of submittals arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts and Contractor's construction schedule.
2. Initial Submittal Schedule: Submit concurrently with initial construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.

   a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

a. Scheduled date for first submittal.
b. Specification Section number and title.
c. Submittal Category: Action; Informational.
d. Name of subcontractor.
e. Description of the Work covered.
f. Scheduled date for Architect's final release or approval.

1.4 SUBMITTAL FORMATS

A. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Electronic submittals shall be in PDF format only.
2. Scans: Scanned images and drawings shall be clear and legible.
3. Zipped files will be rejected.
4. Pages shall be oriented to a “ready to read” orientation.
5. Text shall be searchable.
6. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

   a. Submittals shall be complete and self-contained. Submittals shall not contain web links or require navigation to websites or file sharing services.

7. Submittal Number: Name file with submittal number or other unique identifier, including revision identifier.

   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

8. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
9. File Security: Do not set any permissions restrictions on files; protected, locked, or secured documents will be rejected.
10. Large Format Submittals: All electronic submittals that are larger than 11 x 17 inches shall have one full size printed set submitted. The printed set is for Architect reference only and will not be returned.
11. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Architect**,** containing the following information:

    a. Project name.
    b. Architect’s project number.
    c. Date.
    d. Name of Architect.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Names of subcontractor, manufacturer, and supplier.
    h. Unique submittal number.
    i. Category and type of submittal.
    j. Submittal purpose and description.
    k. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
    l. Drawing number and detail references, as appropriate.
    m. Indication of full or partial submittal.
    n. Location(s) where product is to be installed, as appropriate.
    o. Other necessary identification.
    p. Remarks.
    q. Signature of transmitter.

12. Metadata: Include the following information as keywords in the electronic submittal file metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.
e. .

1.5 SUBMITTAL PROCEDURES

A. General: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website; refer to Section 01 3100 “Project Management and Coordination”. Enter required data in web-based software site to fully identify submittal.

a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

B. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings in their native format for use in preparing Shop Drawings and Project record drawings.

a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
b. Digital Drawing Native Format: The Contract Drawings are available in Autodesk Revit (.rvt); verify exact version with Architect. Architect will not satisfy requests to modify or export files into other formats.
c. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual – Document 01 3129 “Media Distribution Indemnification Form”.
d. The following digital data files will by furnished for each appropriate discipline:

1) Floor plans.
2) Reflected ceiling plans.

C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Resubmittal Review: Allow 15 days for review of each resubmittal.
3. Extended Review: A large quantity of submittals submitted within a short period of time may require additional days for processing and review.

E. Options: Identify options requiring selection by Architect.

F. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by marks on each submittal or noting on attached separate sheet.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
4. Resubmittals will be reviewed once. If additional resubmittals are required, Contractor shall be responsible for Architect’s processing and review fees. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for additional reviews.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

## 1.6 SUBMITTAL REQUIREMENTS

A. General Requirements:

1. Marks: Marks and identifications on the submittals shall be clear and legible, produced by permanent ink, markers, or by electronic means. Highlighter and pencil marks will not be acceptable.
2. Reproduction of the Contract Documents will not be accepted as submittals. The Contract Documents are protected by copyright laws, and shall not be reused or copied in any form without written permission of the authors.
3. Prohibited Submittals: The following items shall not be submitted; if submitted the entire submittal will be rejected.

a. Material Safety Data Sheets (MSDS) and Safety Data Sheets (SDS).
b. Environmental Product Declarations (EPD).
c. Health Product Declarations (HPD).

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.

h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams that show factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrently with Shop Drawings and Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Page/Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

D. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Sample submittals shall be physical hard copies except as indicated below:

a. Physical samples shall be delivered to the Architect with a letter of transmittal. A corresponding electronic submittal shall be uploaded to the web-based Project management software. The electronic submittal shall include a copy of the transmittal, digital image file illustrating Sample characteristics, and identification information for record.

2. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
3. Identification: Permanently attach label on unexposed side of Samples that includes the following:

a. Project name and submittal number.
b. Generic description of Sample.
c. Product name and name of manufacturer.
d. Sample source.
e. Number and title of applicable Specification Section.
f. Specification paragraph number and generic name of each item.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.

a. Quantity of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

    a. Quantity of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

        1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
        2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three units in each sample set that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.

F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

G. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and other performance and design criteria, applicable codes and regulations, calculations, and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

H. Certificates:

1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated or when required by authorities having jurisdiction.

2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.

6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

I. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

   a. Name of evaluation organization.
   b. Date of evaluation.
   c. Time period when report is in effect.
   d. Product and manufacturers' names.
   e. Description of product.
   f. Test procedures and results.
   g. Limitations of use.

## 1.7 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Submit a signed and sealed paper copy when required by authorities having jurisdiction.
2. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

## 1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.

1. Electronic Submittals: Architect will indicate, via markup on each submittal, the appropriate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Rejection of Submittals: Architect may reject submittals without review, or with only a partial review, for any of, but not limited to, the following reasons:

1. Submittal was not required by the Contract Documents.
2. Submittal is received from sources other than Contractor.
3. Submittal is incomplete, including lack of Contractor’s review stamp or letter of transmittal.
4. Submittal lacks identification.
5. Submittal lacks clear identification of applicable products and options.
6. Submittal items requiring Contractor verification or input from the Contractor have not been completed.
7. Product submitted is an unauthorized substitution. Refer to Section 01 2500 for substitution procedures.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

## SECTION 01 4000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:

1. Section 01 2100 "Allowances" for testing and inspection allowances.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.

1. Mockups are used for one or more of the following:

a. Verify selections made under Sample submittals.
b. Demonstrate aesthetic effects.
c. Demonstrate the qualities of products and workmanship.
d. Demonstrate successful installation of interfaces between components and systems.
e. Perform preconstruction testing to determine system performance.

2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.

3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

a. Mockups shall be in-place mockups unless otherwise indicated.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) in accordance with 29 CFR 1910.7, by a testing agency accredited in accordance with NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

## 1.3 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

## 1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

C. If Contract Documents require Work to be accomplished in a manner that make it impossible to produce first-class work, or if discrepancies appear among Contract Documents, Contractor shall request interpretation in writing before proceeding with Work. If Contractor fails to make such request, no excuse will thereafter be entertained for failure to carry out Work in satisfactory manner. Should conflict occur in or between Drawings and Specifications, Contractor is deemed to have included the more expensive Work.

## 1.5 ACTION SUBMITTALS

A. Mockup Shop Drawings: For mockups.

1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

## 1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

E. Reports: Prepare and submit certified written reports and documents as specified.

F. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

## 1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, 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.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and engage in the activities indicated.

1. Requirements of authorities having jurisdiction supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or other independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. Personnel Qualifications: In addition to ASTM E329 requirements, personnel performing testing and inspecting shall have a minimum of 3-years' experience in performing the required testing and be a full-time employee of the agency.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor's Responsibilities:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build laboratory and site-assembled test assemblies and mockups, using supervisors and installers who will perform same tasks for Project.
e. When testing is complete and when directed by the Architect, remove test specimens and test assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.

a. Allow seven days for initial review and each re-review of each mockup.

7. Documentation: Document fabrication of mockups using written and photographic means, especially for concealed conditions. Submit reports for each inspection, describing problems observed and corrections made. Make reports available to field-installation workers.
8. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
9. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
10. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
11. Demolish and remove mockups when directed unless otherwise indicated.

L. In-Situ Interior Mockups: Construct interior in-situ mockups as indicated in the Construction Documents. Provide or simulate finished lighting conditions for review of mockups.

## 1.10 QUALITY CONTROL

A. General: Work is considered defective if it does not pass indicated tests and inspections.

B. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

C. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.

    a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor. Reports shall document all deficiencies, corrective actions, and retesting results.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

F. 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 as specified in Section 01 3300 "Submittal Procedures."

G. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

H. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

I. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

J. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as Work progresses.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

**END OF SECTION**

## SECTION 01 4200 - REFERENCES

### PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms, including "requested," "authorized," "selected," "required," and "permitted," have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms, including "shown," "noted," "scheduled," and "specified," have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. CPSC - U.S. Consumer Product Safety Commission; www.cpsc.gov.
2. DOC - U.S. Department of Commerce; www.commerce.gov.
3. DOD - U.S. Department of Defense; www.defense.gov.
4. DOE - U.S. Department of Energy; www.energy.gov.
5. DOJ - U.S. Department of Justice; www.ojp.usdoj.gov
6. DOS - U.S. Department of State; www.state.gov.
7. EPA - United States Environmental Protection Agency; www.epa.gov.
8. FAA - Federal Aviation Administration; www.faa.gov.
9. GPO - U.S. Government Publishing Office; www.gpo.gov.
10. GSA - U.S. General Services Administration; www.gsa.gov.
11. HUD - U.S. Department of Housing and Urban Development; www.hud.gov.
12. LBNL - Lawrence Berkeley National Laboratory; Energy Technologies Area; www.lbl.gov/.
13. NIST - National Institute of Standards and Technology; www.nist.gov.
14. OSHA - Occupational Safety & Health Administration; www.osha.gov.
15. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
16. USACE - U.S. Army Corps of Engineers; www.usace.army.mil.
17. USDA - U.S. Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
18. USDA - U.S. Department of Agriculture; Rural Utilities Service; www.usda.gov.
19. USP - U.S. Pharmacopeial Convention; www.usp.org.
20. USPS - United States Postal Service; www.usps.com.

D. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from U.S. Government Publishing Office; www.govinfo.gov.
2. DOD - U.S. Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.
3. DSCC - Defense Supply Center Columbus; (see FS).
4. FED-STD - Federal Standard; (see FS).
5. FS - Federal Specification; Available from DLA Document Services; www.dsp.dla.mil/Specs-Standards/.

   a. Available from Defense Standardization Program; www.dsp.dla.mil.
   b. Available from U.S. General Services Administration; www.gsa.gov.
   c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org.

6. MILSPEC - Military Specifications and Standards; (see DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (see USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they are to mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. BEARHFTI; California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; (see BHGS).
2. BHGS; State of California Bureau of Household Goods and Services; (Formerly: California Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation); www.bhgs.dca.ca.gov.
3. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.oal.ca.gov/publications/ccr/.
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; https://tfsweb.tamu.edu/.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

## SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 01 1000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Unless otherwise indicated, Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Unless otherwise indicated, Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

E. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

F. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show

procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

3. Indicate methods to be used to avoid trapping water in finished work.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

**PART 2 - PRODUCTS**

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used. Provide materials suitable for use intended.

B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top rails.

C. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.

D. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Project Meeting Spaces and Field Offices: Coordinate locations and requirements with Owner.

B. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

a. Use of fuel-burning space heaters with open-flames is prohibited.
b. Fuel-fired equipment shall be properly vented to the outdoors.

**PART 3 - EXECUTION**

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities, including but not limited to parking, field offices, and temporary roads, to limit site disturbance as specified in Section 01 1000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Unless otherwise indicated, connect temporary sewers to Owner’s system as directed by authorities having jurisdiction.

C. Water Service: Unless otherwise indicated, connect to Owner's existing water service facilities. Install water service and distribution piping in sizes and pressures adequate for construction. Sterilize temporary water piping before use. Clean and maintain water service facilities in a condition acceptable to Owner.

1. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Use of Permanent Toilets: Use of Owner's existing designated toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Temporary Ventilation and Humidity Control: Provide temporary ventilation and humidity control required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

G. Electric Power Service: Unless otherwise indicated, connect to Owner's existing electric power service. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations. Maintain equipment in a condition acceptable to Owner.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: Each contractor shall provide their own cellular phones for their own use. No additional telephone service will be required.

1. Post a list of important telephone numbers in a conspicuous location, including police and fire departments, ambulance service, Contractor's corporate office, Architect's office, Engineers' offices, Owner's office, and principal subcontractors' field and corporate offices.

## 3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:
1. Utilize designated area within existing building for temporary field offices.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

C. Parking: Use designated areas of Owner's existing parking areas for construction personnel as needed.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel; provide additional offsite parking as needed.

E. Storage and Staging: Use designated areas of Project site for storage and staging needs; provide additional offsite storage as needed.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 7300 "Execution."

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

## 3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 01 1000 "Summary."

C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

E. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
2. After initial completion of envelope enclosure, make roof and other envelope elements weathertight at the end of each working day.
3. Provide walk-off mats at each entrance through temporary enclosures.

H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

I. Building Contents Protection: Provide all necessary protective means to ensure that scientific, electronic, and other equipment and furnishings in the building are not stolen, damaged, or soiled by construction operations. Cooperate with the Owner regarding the removal, relocation and/or protection of all fixtures, furnishings, finishes, and equipment.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure

and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses. Prevent impacts to Owner's operations.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
2. Keep temporary services and facilities clean and neat.
3. Relocate temporary services and facilities as required by progress of the Work.

C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.

D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 "Closeout Procedures."

**END OF SECTION**

## SECTION 01 6000 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

1.1 SUMMARY

A. The Work of This Section Includes: Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 01 1000 "Summary" for Contractor requirements related to Owner-furnished products.
2. Section 01 2100 "Allowances" for products selected under an allowance.
3. Section 01 2500 "Substitution Procedures" for requests for substitutions.
4. Section 01 4200 "References" for applicable industry standards for products specified.
5. Section 01 7700 "Closeout Procedures" for submitting warranties.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless otherwise indicated.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluating Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: Refer to Section 01 2500 “Substitution Procedures”.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 01 3300 "Submittal Procedures." Show compliance with requirements.

F. Substitution: Refer to Section 01 2500 "Substitution Procedures" for definition and limitations on substitutions.

## 1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

B. Compatibility of Products: Verify compatibility of products with substrates and adjoining materials.

C. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is inconspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:

   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.
   e. Ratings.

3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

## 1.4 COORDINATION

A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

## 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of Owner or endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of Owner or endorsed by manufacturer to Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 7700 "Closeout Procedures."

**PART 2 - PRODUCTS**

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.

   a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
   b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.

   a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
   b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 2500 "Substitution Procedures".

C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 2500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when specified conditions are satisfied. If the specified conditions are not satisfied, Architect may return requests without action, except to record noncompliance:

1. Refer to Section 01 2500 “Substitution Procedures”.

B. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. After approval of comparable products, comply with specified submittal requirements in applicable specification sections.

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION**

# SECTION 01 7300 - EXECUTION

## PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:

1. Construction layout.
2. Field engineering.
3. Prefabrication of Work.
4. Installation of the Work.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction and repair of the Work.

B. Related Requirements:

1. Section 01 1000 "Summary" for coordination of and limits on use of Project site.
2. Section 01 3300 "Submittal Procedures" for submitting surveys.
3. Section 01 7329 “Cutting and Patching”.
4. Section 01 7700 "Closeout Procedures" for final cleaning.
5. Section 02 4119 "Selective Demolition" for demolition and removal of selected portions of the building.

1.2 PREINSTALLATION MEETINGS

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.4 QUALITY ASSURANCE

A. Professional Engineer Qualifications: Refer to Section 01 4000 "Quality Requirements."

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

## PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Existing Conditions: The existence and location of construction indicated as existing is not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. 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. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 01 2613 "Requests for Information".

### 3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the existing conditions. If discrepancies are discovered, notify Architect promptly.

B. General: Lay out the Work using accepted industry practices.

1. Establish benchmarks and control points to set lines and levels as needed to locate each element of Project.
2. Establish limits on use of Project site.

3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close layouts with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

## 3.4 PREFABRICATION

A. Products in project are intended to be fabricated and installed on-site/in-situ unless prefabrication is specifically indicated.

1. If Contractor elects to prefabricate Work not indicated to be prefabricated, Contractor shall propose the change in the form of a Substitution Request in accordance with Section 01 2500 “Substitution Procedures”. The proposal shall include, but is not limited to, the following:

   a. Delegated design for engineering of prefabricated units. Engineering shall account for loads and stresses related to handling, shipping, and lifting.
   b. Mockups.

## 3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. 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.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

## 3.6 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, in accordance with regulations.

a. Use containers intended for holding waste materials of type to be stored.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces in accordance with written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 7419 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

## 3.7 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components.

B. Prior to startup verify each piece of equipment and system has been checked for completeness of installation, including wiring and supports. Verify proper lubrication, drive rotation, belt tension, control sequence, and other conditions which may cause damage on startup.

C. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

D. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

E. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

F. Manufacturer's Field Service: Comply with qualification requirements in Section 01 4000 "Quality Requirements."

## 3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

C. Comply with manufacturer's written instructions for temperature and relative humidity.

## 3.9 CORRECTION AND REPAIR OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
2. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
3. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

1. Where damaged or worn items cannot be repaired or restored, provide replacements.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

    a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
4. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
5. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

C. Restore damaged construction and permanent facilities used during construction to their specified condition.

**END OF SECTION**

## SECTION 01 7329 - CUTTING AND PATCHING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General administrative and procedural requirements governing cutting and patching of the Work.

B. Related Requirements:

1. Section 01 7300 “Execution” for procedures governing the execution of the Work.
2. Section 02 4119 "Selective Demolition" for demolition and removal of selected portions of the building.
3. Section 07 8413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

a. Contractor's superintendent.
b. Trade supervisor responsible for cutting operations.
c. Trade supervisor(s) responsible for patching of each type of substrate.
d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

1.5 QUALITY ASSURANCE

A. Cutting and Patching Worker Qualifications: Employ skilled, experienced workers to perform cutting and patching.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include but are not limited to the following:

   a. Primary operational systems and equipment.
   b. Fire separation assemblies.
   c. Air or smoke barriers.
   d. Fire-suppression systems.
   e. Plumbing piping systems.
   f. Mechanical systems piping and ducts.
   g. Control systems.
   h. Communication systems.
   i. Fire-detection and -alarm systems.
   j. Conveying systems.
   k. Electrical wiring systems.
   l. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Sprayed fire-resistive material.
   d. Equipment supports.
   e. Piping, ductwork, vessels, and equipment.
   f. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

**PART 3 - EXECUTION**

3.1 CUTTING AND PATCHING

A. General: Employ qualified workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Doors: Adjust and trim bottoms of doors as necessary to swing unimpeded over flooring.
6. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
7. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of

uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

H. Sprayed Fire-Resistive Materials: Where sprayed fire-resistive materials are applied, remove only to extent necessary for Work. Patch or replace sprayed fire-resistive materials removed or damaged during installation of Work to maintain original fire rating.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

**END OF SECTION**

## SECTION 01 7700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final Completion procedures.
3. List of incomplete items.
4. Submittal of Project warranties.
5. Final cleaning.

1.2 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete. Also known as a “punch list”.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Reports:

1. For pest-control inspection.
2. For HVAC system cleaning.

D. Warranty Electronic File.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner’s signature for receipt of submittals.

5. Submit operations and maintenance manuals in accordance with Section 01 7823 “Operations and Maintenance Data”.
6. Submit project record documents in accordance with Section 01 7839 “Project Record Documents”.
7. Submit testing, adjusting, and balancing records.
8. Submit sustainable design submittals not previously submitted.
9. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Advise Owner of changeover in utility services.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements.
10. Complete correction and repair of the Work.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. Upon receipt of request, Architect will either proceed with review or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after review or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Final Completion.

3. Architect will provide one review of the Work for purposes of judging compliance with design intent and to establish date of Substantial Completion. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for fees for additional reviews.

## 1.7 FINAL COMPLETION PROCEDURES

A. After Substantial Completion, expedite Final Completion of remaining work in an organized, efficient manner that maintains quality standards. Perform such work as follows:

1. Schedule work in advance with Owner.
2. Perform work in occupied spaces when space is not in use. Unless otherwise approved by Owner, this may require work to be performed outside of normal business hours; such overtime or premium time shall be at no additional cost to Owner.
3. If work is approved by Owner to be performed in occupied spaces, perform the work in a manner to not significantly interfere with, hamper, or inconvenience Owner’s program or functions.
4. Clean work immediately following its completion.

B. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Section 01 2900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit HVAC system final cleaning report.

C. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. Upon receipt of request, Architect will either proceed with review or notify Contractor of unfulfilled requirements. After review, Architect will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Architect will provide one review of the Work for purposes of verifying Contractor’s completion of outstanding punchlist items. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for fees for additional reviews.

## 1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

a. Electronic file in a format acceptable to the Architect; Architect will return annotated file.

B. Contractor's Punch List Tools: Upon mutual agreement by Contractor and Architect, the Contractor shall temporarily provide the Architect hardware and/or software related to development and management of the Contractor's punch list.

1. Contractor shall provide usage training upon request.
2. Architect's use of Contractor's punch list tools shall be limited to the Work.
3. Contractor is responsible for compliance with associated licensing requirements.
4. Architect will return the Contractor's hardware and software upon Final Completion.
5. Refer to Section 01 7700 "Closeout Procedures" for additional punch list requirements.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit on digital media acceptable to Architect.

E. Provide additional copies of each warranty to include in operation and maintenance manuals.

**PART 2 - PRODUCTS**

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

**PART 3 - EXECUTION**

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Definitions:

a. Thorough Cleaning:

1) Thorough cleaning is required unless otherwise indicated.
2) Remove dust, dirt, debris, laitance, grease, oil, stains, discolorations, droppings, markings, and other soil or foreign matter or substance.
3) Use appropriate methods such as sweeping, scrubbing, mopping, washing, dusting, and vacuuming so surface is completely clean and streak free.

b. Broom Clean: Remove visible dirt, dust, and debris from surface with a new, high quality, clean broom by thoroughly and properly sweeping or brooming.

2. Sequence cleaning to avoid performing work in spaces after final cleaning.
3. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Remove tools, construction equipment, machinery, and surplus material from Project site.
d. Remove snow and ice to provide safe access to building.
e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Clean flooring, removing debris, dirt, and staining; clean in accordance with manufacturer's instructions.
h. Vacuum and mop concrete. In unoccupied spaces, concrete floors shall be broom clean.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean in accordance with manufacturer's instructions if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean ducts, blowers, and coils.

1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Clean strainers.
r. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Section 01 5000 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 01 5000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 01 7300 "Execution" before requesting inspection for determination of Substantial Completion.

**END OF SECTION**

## SECTION 02 4119 - SELECTIVE DEMOLITION

### PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. Demolition and removal of selected portions of exterior or interior of building or structure.
2. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

B. Related Requirements:

1. Section 01 1000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 01 7300 "Execution" for cutting and patching procedures.
3. Section 01 7329 "Cutting and Patching" for cutting and patching procedures.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner as indicated.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage; prepare for reuse; and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 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.

1.4 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

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 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.
6. Review and finalize protection requirements.
7. Review storage, protection, and accounting for items to be removed for salvage or reinstallation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Survey of Existing Conditions: Submit survey.

D. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property. Indicate proposed locations and construction of barriers.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed in accordance with EPA regulations. Include name and address of technician and date refrigerant was recovered.

F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Universal certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials, if any, will be removed by Owner before start of the Work.

2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

D. On-site sale of removed items or materials is not permitted.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

1. Verify existing warranties with Owner before start of Work.

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 PERFORMANCE 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/ASSP 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 Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Verify that hazardous materials, if any, have been remediated before proceeding with building demolition operations.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

1. Inventory and record the condition of items to be removed for salvage or reinstallation. Photograph or video conditions that might be misconstrued as damage caused by removal.
2. Photograph or video existing conditions of adjoining construction including finish surfaces, that might be misconstrued as damage caused by selective demolition operations or removal of items for salvage or reinstallation.

3.2 PREPARATION

A. Temporary Shoring: Design, 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.

B. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 5000 "Temporary Facilities and Controls."

C. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment in accordance with 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND BUILDING SYSTEMS

A. Existing Services/Systems to Remain: Maintain utilities and building systems and equipment to remain and protect against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utilities and building systems serving areas to be selectively demolished.
1. Arrange to shut off utilities with utility companies.
2. Demolish and remove existing building systems, equipment, and components indicated on Drawings to be removed.

a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
b. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
c. Equipment to Be Removed: Disconnect and cap services and remove equipment and components.

3. Abandon existing building systems, equipment, and components indicated on Drawings to be abandoned in place.

a. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
b. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

4. Remove and reinstall/salvage existing building systems, equipment, and components indicated on drawings to be removed and reinstalled or removed and salvaged:

a. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment and components; when appropriate, reinstall, reconnect, and make equipment operational.

b. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and components and deliver to Owner.

## 3.4 SALVAGE/REINSTALL

A. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

B. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

## 3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to 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. 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 portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 1 hour after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. 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. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.

2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

D. Resilient Floor Coverings: Remove floor coverings and adhesive in accordance with recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 07 5323 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

F. Building Envelope: Remove and alter building envelope components as needed to complete the Work, but perform in a manner to prevent water leakage and damage to structure and interior areas.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

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.

B. Burning: Do not burn demolished materials.

3.8 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**

## SECTION 04 0120.64 - BRICK MASONRY REPOINTING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Repointing joints with mortar.

1.2 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to repointing brick masonry including, but not limited to, the following:

a. Verify brick masonry repointing specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.
c. Quality-control program.
d. Coordination with building occupants.
e. .

1.4 SEQUENCING AND SCHEDULING

A. Order sand and gray portland cement for pointing mortar immediately after approval of. Take delivery of and store at Project site enough quantity to complete Project.

B. Work Sequence: Perform brick masonry repointing work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry.
5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
6. Repair masonry, including replacing existing masonry with new masonry materials.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
10. Where water repellents are to be used on or near masonry work, delay application of these chemicals until after pointing and cleaning.

1.5 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 recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of repointing work on the structure.
2. Show provisions for expansion joints or other sealant joints.
3. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

C. Samples for Initial Selection: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.

   a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching existing, cleaned mortar when cured and dry.
   b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.

2. Sand Type Used for Pointing Mortar: Minimum 8 oz. of each in plastic screw-top jars.
3. Sealant materials.
4. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.

   a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.

2. Sealant materials.
3. Accessories: Each type of accessory and miscellaneous support.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For brick masonry repointing specialist.

B. Quality-control program.

1.7 QUALITY ASSURANCE

A. Brick Masonry Repointing Specialist Qualifications: Engage an experienced brick masonry repointing firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing masonry is insufficient experience for masonry repointing work.

1. Field Supervision: Brick masonry repointing specialist firms shall maintain experienced full-time supervisors on Project site during times that brick masonry repointing work is in progress.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage.

C. Mockups: Prepare mockups of brick masonry repointing to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Repointing: Rake out joints in two separate areas as indicated for each type of repointing required, and repoint one of the areas.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

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 hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

## 1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits: Repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients and existing masonry walls to produce temperatures between 40 and 120 deg F.
2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after pointing.

D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for repointing brick masonry (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

### 2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: ASTM C91/C91M.

D. Mortar Cement: ASTM C1329/C1329M.

E. Mortar Sand: ASTM C144.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Mortar Pigments: ASTM C979/C979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.

G. Water: Potable.

### 2.3 ACCESSORY MATERIALS

A. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

B. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could leave residue on surfaces.

### 2.4 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:
1. Pointing Mortar by Property: ASTM C270, Property Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime masonry cement or mortar cement. Add mortar pigments to produce mortar colors required.

## PART 3 - EXECUTION

### 3.1 PROTECTION

A. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below pointing work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed masonry and other surfaces.

B. Remove gutters and downspouts and associated hardware adjacent to masonry and store during masonry repointing. Reinstall when repointing is complete.

1. Provide temporary rain drainage during work to direct water away from building.

### 3.2 MASONRY REPOINTING, GENERAL

A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

### 3.3 REPOINTING

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints indicated as sealant-filled joints.
3. Joints at locations of the following defects:

a. Holes and missing mortar.
b. Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.
c. Cracks 1/16 inch or more in width and of any depth.
d. Hollow-sounding joints when tapped by metal object.
e. Eroded surfaces 1/4 inch or more deep.
f. Deterioration to point that mortar can be easily removed by hand, without tools.
g. Joints filled with substances other than mortar.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth of 2 times joint width and not less than that required to expose sound, unweathered mortar. Do not remove unsound mortar more than 2 inches deep; consult Architect for direction.
2. Remove mortar from brick and other masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of brick or other masonry units or widen joints. Replace or patch damaged brick or other masonry units as directed by Architect.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer, and allow it to become thumbprint hard before applying next layer.
3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
6. Hairline cracking within mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

## 3.4 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonmasonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Remove masking materials, leaving no residues that could trap dirt.

## 3.5 FIELD QUALITY CONTROL

A. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work

completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

B. Notify Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

**END OF SECTION**

## SECTION 04 0140.62 - STONE REPOINTING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Repointing joints with mortar.
2. Repointing joints with sealant.

1.2 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

B. Rift: The most pronounced direction of splitting or cleavage of a stone.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to repointing stonework including, but not limited to, the following:

a. Verify stone repointing specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
b. Materials, material application, sequencing, tolerances, and required clearances.
c. Quality-control program.
d. Coordination with building occupants.

1.4 SEQUENCING AND SCHEDULING

A. Order sand and gray portland cement for pointing mortar immediately after approval of Samples. Take delivery of and store at Project site enough quantity to complete Project.

B. Work Sequence: Perform stone repointing work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean stone.
5. Rake out mortar from joints surrounding stone to be replaced and from joints adjacent to stone repairs along joints.
6. Repair stonework, including replacing existing stone with new stone.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
10. Where water repellents are to be used on or near stonework, delay application of these chemicals until after pointing and cleaning.

1.5 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 recommendations for product application and use.
3. Include test data substantiating that products comply with requirements.

B. Shop Drawings:

1. Include plans, elevations, sections, and locations of repointing work on the structure.
2. Show provisions for expansion joints or other sealant joints.
3. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

C. Samples for Initial Selection: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.

   a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching the existing, cleaned mortar when cured and dry.
   b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.

2. Sand Type Used for Pointing Mortar: Minimum 8 oz. of each in plastic screw-top jars.
3. Sealant materials.
4. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.

   a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.

2. Sealant materials.
3. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.6 QUALITY ASSURANCE

A. Stone Repointing Specialist Qualifications: Engage an experienced stone repointing firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience in only installing standard unit masonry or new stone masonry is insufficient experience for stone repointing work.

1. Field Supervision: Stone repointing specialist firms shall maintain experienced full-time supervisors on Project site during times that stone repointing work is in progress.

B. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use materials and tools without damaging stonework. Include provisions for supervising performance and preventing damage.

C. Mockups: Prepare mockups of stone repointing to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Repointing: Rake out joints in two separate areas, each approximately 36 inches high by 48 inches wide for each type of repointing required, and repoint one of the areas.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

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 hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits: Repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients and existing stone to produce temperatures between 40 and 120 deg F.
2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after pointing.

D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar materials. Provide artificial shade and wind breaks, and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. Source Limitations: Obtain each type of material for stone repointing (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

## 2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or Type II, except Type III may be used for cold-weather construction; white or gray, or both where required for color matching of mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Masonry Cement: ASTM C91/C91M.

D. Mortar Cement: ASTM C1329/C1329M.

E. Mortar Sand: ASTM C144.

1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
2. Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

F. Mortar Pigments: ASTM C979/C979M, compounded for use in mortar mixes, and having a record of satisfactory performance in stone mortars.

G. Water: Potable.

## 2.3 ACCESSORY MATERIALS

A. Sealant Materials:

1. Sealant manufacturer's standard elastomeric sealant(s) of base polymer and characteristics indicated below and according to applicable requirements in Section 07 9200 "Joint Sealants."

a. Type: Single-component, nonsag urethane sealant.

2. Colors: Provide colors of exposed sealants to match colors of mortar adjoining installed sealant unless otherwise indicated.

B. Joint-Sealant Backing:

1. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
2. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended in writing by sealant manufacturer for preventing sealant from adhering to rigid, inflexible, joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

C. Masking Tape: Nonstaining, nonabsorbent material; compatible with mortar, joint primers, sealants, and surfaces adjacent to joints; and that easily comes off entirely, including adhesive.

D. Other Products: Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Minimal possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.

5. Do not use products or tools that could leave residue on surfaces.

2.4 MORTAR MIXES

A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again, adding only enough water to produce a damp, unworkable mix that retains its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.

B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mixes: Mix mortar materials in the following proportions:
1. Pointing Mortar by Property: ASTM C270, Property Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime masonry cement or mortar cement. Add mortar pigments to produce mortar colors required.

**PART 3 - EXECUTION**

3.1 PROTECTION

A. Prevent mortar from staining face of surrounding stone and other surfaces.

1. Cover sills, ledges, and other projecting items to protect them from mortar droppings.
2. Keep wall area wet below pointing work to discourage mortar from adhering.
3. Immediately remove mortar splatters in contact with exposed stone and other surfaces.

B. Remove downspouts and associated hardware adjacent to stone and store during stone repointing. Reinstall when repointing is complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.2 STONE REPOINTING, GENERAL

A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet away by Architect.

3.3 REPOINTING

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.

2. Joints indicated as sealant-filled joints.
3. Joints at locations of the following defects:

    a. Holes and missing mortar.
    b. Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.
    c. Cracks 1/16 inch or more in width and of any depth.
    d. Hollow-sounding joints when tapped by metal object.
    e. Eroded surfaces 1/4 inch or more deep.
    f. Deterioration to point that mortar can be easily removed by hand, without tools.
    g. Joints filled with substances other than mortar.

B. Do not rake out and repoint joints where not required.

C. Rake out joints as follows, according to procedures demonstrated in approved mockup:

1. Remove mortar from joints to depth of 2 times joint width and not less than that required to expose sound, unweathered mortar. Do not remove unsound mortar more than 2 inches deep; consult Architect for direction.
2. Remove mortar from stone surfaces within raked-out joints to provide reveals with square backs and to expose stone for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
3. Do not spall edges of stone units or widen joints. Replace or patch damaged stone units as directed by Architect.

D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose stone, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8 inch until a uniform depth is formed. Fully compact each layer, and allow it to become thumbprint hard before applying next layer.
3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8 inch. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing stone has worn or rounded edges, slightly recess finished mortar surface below face of stone to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed stone surfaces or to featheredge the mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
6. Hairline cracking within mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

F. Pointing with Sealant: Comply with Section 07 9200 "Joint Sealants" and as follows:

1. After raking out, keep joints dry and free of mortar and debris.
2. Clean and prepare joint surfaces. Prime joint surfaces unless sealant manufacturer recommends against priming. Do not allow primer to spill or migrate onto adjoining surfaces.
3. Fill sealant joints with specified joint sealant.

    a. Install cylindrical sealant backing beneath the sealant. Where space is insufficient for cylindrical sealant backing, install bond-breaker tape.
    b. Install sealant using only proven installation techniques that ensure that sealant is deposited in a uniform, continuous ribbon, without gaps or air pockets, and with complete wetting of the joint bond surfaces equally on both sides. Fill joint flush with surrounding stonework and matching the contour of adjoining mortar joints.

c. Install sealant as recommended in writing by sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead:

1) Fill joints to a depth equal to joint width, but not more than 1/2 inch deep or less than 1/4 inch deep.

d. Tool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant from surfaces adjacent to joint.

e. Do not allow sealant to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces, particularly rough textures. Remove excess and spillage of sealant promptly as the work progresses. Clean adjoining surfaces by the means necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes, as demonstrated in an approved mockup.

G. Where repointing work precedes cleaning of existing stone, allow mortar to harden at least 30 days before beginning cleaning work.

## 3.4 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed stone surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Clean adjacent nonstone surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Remove masking materials, leaving no residues that could trap dirt.

## 3.5 FIELD QUALITY CONTROL

A. Architect's Project Representatives: Architect will assign Project representatives to help carry out Architect's responsibilities at the site, including observing progress and quality of portion of the Work completed. Allow Architect's Project representatives use of lift devices and scaffolding, as needed, to observe progress and quality of portion of the Work completed.

B. Notify Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Architect's Project representatives have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

**END OF SECTION**

## SECTION 04 2000 - UNIT MASONRY

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Masonry-joint reinforcement.
4. Ties and anchors.
5. Embedded flashing.
6. Accessories.

B. Products Installed but not Furnished under This Section:
1. Cavity wall insulation.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 COORDINATION

A. Coordinate and verify compatibility of cavity wall materials in this Section with air barrier in Section 07 2500 “Fluid-Applied Membrane Air Barriers”.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meeting shall include the following attendees:

a. Owner’s Representative.
b. Architect.
c. Masonry installer.

2. Review masonry requirements and installation, substrate condition, forecasted weather conditions, special details, mockups, testing and inspection procedures, air-barrier installation, flashing sequencing, and work scheduling.
3. Review submittals.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.

2. Reinforcing Steel: Indicate bending, lap lengths, sizes, and placement of unit masonry reinforcing bars. Comply with ACI 315R. Provide elevations of reinforced walls.
3. Joint reinforcement locations.
4. Ties and Anchors: Tie and anchor types, placement, and attachment.
5. Fabricated Flashing: Detail corner units, end-dam units, and other special applications. Indicate flashing attachment and sealing to substrates.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For Installers and testing agency.

B. Material Certificates: For each type of the following:

1. Masonry Units:

a. Include material test reports substantiating compliance with specified requirements.
b. For masonry units, include data and calculations establishing average net-area compressive strength of units.

2. Preblended, dry mortar mixes. Include description of type and proportions of ingredients including admixtures.
3. Grout mixes. Include description of type and proportions of ingredients including admixtures.
4. Reinforcing bars.
5. Joint reinforcement.
6. Anchors, ties, and metal accessories.
7. Masonry Cleaner: Certification from masonry unit manufacturers that selected cleaner is acceptable.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

D. 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 in accordance with TMS 602.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Installer Qualification: Installers on Project shall have a minimum of 5 years' successful experience with unit masonry projects and have successfully completed a minimum of 5 projects of similar scope and complexity.

1.8 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. Deliver preblended, dry mortar and grout mixes in moisture-resistant containers. Store preblended, dry mortar and grout mixes in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 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 (600 mm) 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 (600 mm) 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.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) 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.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain each type of 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.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients, including color for exposed masonry, from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Where masonry wall cavity depths and conditions exceed manufacturer's recommended sizes of ties and anchors, engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design ties and anchors.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602, 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.

2.4 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners of interior masonry unless otherwise indicated.

B. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2000 psi.
2. Density Classification: Lightweight.
3. Size (Width): Manufactured to dimensions 3/8 inch (10 mm) less than nominal dimensions.

2.5 LINTELS

A. 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 MORTAR AND GROUT MATERIALS

A. Preblended Dry Mortar Mix: Packaged blend made from portland cement and hydrated lime, sand, and admixtures and complying with ASTM C1714/C1714M.

1. 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.

a. Alkali Content: Not more than 0.1 percent when tested in accordance with ASTM C114.

2. Hydrated Lime: ASTM C207, Type S.

B. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

C. Aggregate for Grout: ASTM C404.

D. Water: Potable.

## 2.7 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60 (Grade 420).

B. Masonry-Joint Reinforcement, General: ASTM A951/A951M.

1. Interior Walls: Mill- galvanized carbon steel.
2. Exterior Walls, including walls in non-conditioned spaces: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
6. Provide in lengths of not less than 10 feet (3 m).

C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

## 2.8 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) 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. Mill-Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A641/A641M, Class 1 coating.
2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A153/A153M, Class B-2 coating.
3. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
4. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.

1. Use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm).
2. Wire: Fabricate from 3/16-inch- (4.76-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls above grade unless otherwise indicated.

## 2.9 EMBEDDED FLASHING

A. Two-Piece Flashing: Flashing consists of two components, a flexible flashing membrane with metal flashing drip edge. Components are as specified in this article.

1. Metal Flashing – Drip Edge: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

a. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.016 inch (0.40 mm) thick.
b. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
c. Fabricate metal drip edges from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees and hemmed. Outer edge shall be hemmed where it is within reach of the public and building occupants.

d. Where indicated, fabricate metal sealant stops from stainless steel. Extend at least 3 inches (76 mm) into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch (19 mm) and down into joint 1/4 inch (6 mm) to form a stop for retaining sealant backer rod.
e. Where indicated, fabricate metal flashing receivers from stainless steel. Extend at least 3 inches (76 mm) into wall and 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees.
f. Solder metal items at corners.
g. Solder for Stainless Steel: ASTM B32, with acid flux of type recommended by stainless steel sheet manufacturer.

2. Flexible Flashing: Use the following unless otherwise indicated:

a. Flexible Stainless Steel Flashing: Composite, self-adhesive flashing product consisting of a pliable stainless steel core with one uncoated (bare) stainless steel face (outward facing) with a butyl block copolymer adhesive (inward facing). Flashing shall be UV-resistant and not require use of primers.

1) Products: Subject to compliance with requirements, provide one of the following:

a) GE Silicones, Inc.; GE Elemax SS Flashing.
b) Illinois Products Corporation; IPCO Self-Adhering Stainless Steel Flashing.
c) STS Coatings, Inc.; Wall Guardian Self Adhering Stainless Steel Flashing.
d) VaproShield, LLC; Vapro-SS Flashing SA
e) York Manufacturing, Inc.; York 304 SA.

2) Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 2 mils nominal thickness.
3) Tensile Strength: 90,000 psi minimum, ASTM D882.
4) Puncture Resistance: 2,500 psi minimum, ASTM E154.
5) Adhesion: 20 psi minimum, PSTC-1.
6) Passes air barrier material test ASTM E2178.
7) Temperature Stability: -70 to 200 deg F.
8) Fire Resistance: Class A, ASTM E84.
9) Mold Resistance: Pass, ASTM D3273.
10) Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

B. End Dams: Provide end dams at all flashing terminations. End dams shall have a minimum height of 2 inches. The front edge of end dams shall be cut back at 30-degree angle from vertical to prevent the vertical edge of the end dams showing in the finished masonry work. Fabricate end dams as follows:

1. Flexible flashing, either prefabricated or field-formed. Apply sealant to joints. Completed end dams shall be watertight.

C. Single-Wythe CMU Flashing System: System of CMU cell flashing pans and interlocking CMU web covers made from UV-resistant, high-density polyethylene. Cell flashing pans have integral weep spouts designed to be built into mortar bed joints and that extend into the cell to prevent clogging with mortar.

D. Sealants for Metal Flashings:

1. Elastomeric Sealant: ASTM C920, chemically curing silicone or silyl-terminated polyether sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

F. Termination Bars for Flexible Flashing: Stainless steel 0.019 inch by 1-inch (0.48 mm by 25 mm) minimum, predrilled holes 8 inches on center maximum, with a sealant flange/lip at top.

## 2.10 ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or 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.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type II (No. 30 asphalt felt).

D. Polyethylene Sheet: 6 mil minimum thickness.

E. Weep/Cavity Vent Products:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe, in color selected by Architect from manufacturer's standard.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Advanced Building Products Inc.; Mortar Maze Weep Vent.
2) Heckmann Building Products, Inc.; No. 85 Cell Vent.
3) Hohmann & Barnard, Inc; QV Quadro-Vent.
4) Wire-Bond; Cell Vent (#3601).

F. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Advanced Building Products Inc.; Mortar Break DT.
b. Heckmann Building Products, Inc.; Weep-Thru Mortar Deflector #84.
c. Hohmann & Barnard, Inc; Mortar Trap.
d. Mortar Net Solutions; Mortar Net.
e. Wire-Bond; Cavity Net DT.
f. York Manufacturing, Inc; Weep-Net.

2. Configuration:

a. Strips, full depth of cavity and 10 inches (250 mm) high, with dovetail-shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings.

## 2.11 MASONRY CLEANERS

A. Proprietary Non-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 and pigmented mortar surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturers of masonry units and pigmented mortar being cleaned.

2.12 MORTAR AND GROUT MIXES

A. General: Mortars and grouts shall be factory pre-blended.

1. Preblended, Dry Mortar Mix: Comply with ASTM C1714 and the requirements of this Section. Furnish dry mortar ingredients, including pigments, if any, in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
2. Preblended, Dry Grout Mix: Comply with ASTM C476 and the requirements of this Section. Furnish dry grout ingredients in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

   a. Batch Plant Grout Mix: Grout that is batched, hydrated and mixed at a batch plant and transported to the site in concrete mixing trucks is acceptable. Submit batch tickets.

3. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Admixtures shall be designated by their manufacturer as designed specifically for use in mortar and/or grout, as appropriate.

   a. Do not use calcium chloride in mortar and grout.
   b. Use portland cement-lime mortar unless otherwise indicated.
   c. 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.
   d. Do not use admixtures that lower the freezing temperature of mortar and grout.

B. Mortar for Unit Masonry: Comply with ASTM C270, 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: Type S.
2. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls: Type N.
3. For interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated: Type N.
4. For repointing existing masonry: Type N.

C. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.1.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured in accordance with ASTM C143/C143M.

**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 substrates are free of substances that impair mortar bond.
3. Verify that foundations are within tolerances specified.
4. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate and all penetrations are sealed to prevent air infiltration or water penetration.

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. Cutting: 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. Frozen Materials: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing.

G. Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar, and reset in fresh mortar.

H. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

## 3.3 LAYING MASONRY WALLS

A. Layout: 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 (100-mm) horizontal face dimensions at corners or jambs.

C. Concealed Masonry: Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches (100 mm). Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch (100-mm) 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.

1. 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.

F. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated. Provide vertical reinforcing where indicated.

3.4 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 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. Joint Tooling: Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated. Joint surface shall be densely packed and uniform in thickness and texture.

D. Joint Profiles:

1. Concave Joints: Joints shall be standard concave joints, where exposed.
2. Flush Joints: Cut joints flush where indicated and as follows:

a. Masonry walls indicated to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
b. Masonry walls indicated to receive waterproofing, cavity wall insulation, or air barriers unless otherwise indicated.

3. Raked Joints: Joints raked for sealant installation shall be raked not less than 1 inch deep.
4. Exposed interior joints shall be rubbed with a stone to remove all burrs and projections of mortar, prior to application of paint or other finishes, if any.

3.5 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Provide continuous horizontal joint reinforcement in the following masonry types:

a. CMU backup wythe.
b. CMU veneers.

2. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
3. Provide continuity at wall intersections by using prefabricated T-shaped units.
4. Provide continuity at corners by using prefabricated L-shaped units.
5. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

a. Prior to installation, repair cuts and abrasions of galvanized components with a suitable galvanizing coating.

B. Joint Reinforcement Locations: Unless indicated otherwise on Drawings:

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 16 inches (406 mm) beyond openings.
3. Provide continuous joint reinforcement in first joint below top of wall.

3.6 CAVITY WALLS

A. Anchor masonry veneer as follows:

1. Masonry-Veneer Anchors:

a. Use adjustable-type (two-piece-type) ties.
b. Fasten anchors to concrete and masonry backup with metal fasteners of type indicated. Fasten per manufacturer's written instructions.

B. Spacing: Space anchors as indicated, but not less than one anchor for 1.77 sq. ft. (0.16 sq. m) of wall area spaced not to exceed 24 inches (610 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. At intersecting and abutting walls, provide anchor at no more than 24 inches (610 mm) o.c. vertically.

1. Provide additional anchors within 12 inches (305 mm) of openings and space not more than 16 inches (406 mm) apart around perimeter of openings.
2. Locate anchor sections to allow maximum vertical differential movement of anchors up and down.
3. Embed connector sections in masonry joints.

C. Provide not less than 1 inch (25 mm) of airspace between back of masonry veneer and face of insulation.

1. Keep cavity airspace clean of mortar droppings and other materials during construction. Bevel beds away from airspace, to minimize mortar protrusions into airspace. Do not attempt to trowel or remove mortar fins protruding into airspace.

D. Coordinate installation of anchors with air barrier installation. When anchors are installed after air barrier installation, coordinate repair of air barrier penetrations with Section 07 2726 "Fluid-Applied Membrane Air Barriers".

E. Installing Cavity Wall Insulation: Refer to Section 07 2100 "Thermal Insulation".

3.7 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.

1. Locations: Locate control and expansion joints where indicated on Drawings. Where not indicated, provide control and expansion joints as follows:

a. General Spacing: Maximum of 20 feet apart.
b. Outside Corners: Maximum of 2 feet from at least one side of outside corners.
c. Inside Corners: Provide control and expansion joints at all inside corners.
d. Openings: In accordance with NCMA TEK 10-2C.
e. Changes in wall height: Provide control and expansion joints at all wall height changes.
f. Coordinate exact locations with Architect prior to installation.

2. Sealants: Install sealant, primers, bond breakers, and backer rod specified in Section 07 9200 "Joint Sealants".

B. Control Joints in Concrete Masonry:

1. Single-wythe and backup wythe in multi-wythe construction: Form control joints using one of the following methods:

a. 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.

b. Install preformed control-joint gaskets designed to fit standard sash block.
c. 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.

2. Veneer Wythe: Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant and backer rod specified in Section 07 9200 "Joint Sealants".

3.8 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, top of wall, and other obstructions to upward flow of air in cavities, and where indicated.

1. Flashings shall be sloped slightly to the exterior.
2. Flexible flashings shall be continuously supported and sloped to the exterior as required for positive drainage.
3. Flash and seal flashings to air barrier as recommended by air barrier manufacturer.
4. Provide end dams as indicated in Part 2 of this Section at all flashing terminations.

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 masonry-veneer walls, extend flashing through veneer, across airspace behind veneer, and up face of sheathing/supporting substrate at least 8 inches (200 mm).

a. Veneer Walls Without Cavity Insulation: Increase vertical dimension to 16 inches (400 mm).

3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
4. Install metal drip edges beneath flexible flashing at exterior face of wall; drip edges shall extend 1/2 inch (13 mm) minimum beyond face of masonry.

a. Bed drip edge in elastomeric sealant.
b. Stop flexible flashing not less than 3/4 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
c.

5. Terminate top edge of flexible flashing as recommended by the manufacturer, but not less than a mechanically fastened termination bar and sealant/mastic. Fasten termination bar at 8 inches on center.
6. Lap end joints of flashings a minimum of 4 inches and seal watertight with not less than two transverse beads of silicone sealant.

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. Place cavity drainage material in airspace between veneers and cavity insulation immediately above all locations of through-wall flashing.

F. 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. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
3. Install weep holes adjacent to end dams.

G. 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.

## 3.9 GROUTING OF HOLLOW METAL DOOR AND WINDOW FRAMES

A. Do not grout hollow metal frames.

## 3.10 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 (12 mm) or minus 1/4 inch (6 mm).
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) 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 (6 mm in 3 m), or 1/2-inch (12-mm) 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2-inch (12-mm) maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.11 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/cavity vents, 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 nonmasonry 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 concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
6. When recommended by masonry unit manufacturers, clean masonry with a proprietary cleaner applied in accordance with manufacturer's written instructions.
7. Clean stone trim to comply with stone supplier's written instructions.
8. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

E. Decorative Concrete Masonry Sealers: Apply masonry unit manufacturer’s recommended sealers if not factory-applied. Apply in accordance with sealer manufacturer’s written instructions.

3.12 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.

**END OF SECTION**

## SECTION 04 4313.13 - ANCHORED STONE MASONRY VENEER

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Stone masonry anchored to cold-formed metal framing and sheathing.

1.2 COORDINATION

A. Advise installers of adjacent Work about specific requirements for placement of reinforcement, veneer anchors, flashing, and similar items to be built into stone masonry.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of stone veneer and their connections. Show anchorage and accessory items.

C. Samples for Initial Selection:

1. Pigmented mortar.

D. Samples for Verification:

1. For each stone type indicated. Include at least four Samples in each set and show the full range of color and other visual characteristics in completed Work.
2. For each color of mortar required.
3. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.

E. Delegated-Design Submittal: For stone veneer anchoring showing location of each anchor, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates:

1. Masonry Cleaner: Certification from stone masonry sources that selected cleaner is acceptable.

C. Material Test Reports:

1. Stone Test Reports: For stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous three years.
2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters.

1. Installers on Project shall have a minimum of 5 years' successful experience with stone masonry projects and have successfully completed a minimum of 5 projects of similar scope and complexity.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

C. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, in a dry location, or in covered weatherproof dispensing silos.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Refer to Section 04 2000 "Unit Masonry".

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Source Limitations for Stone: Obtain stone,from single quarry with resources to provide materials of consistent quality in appearance and physical properties.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality for each cementitious component from single manufacturer and each aggregate from single source or producer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design stone anchors.

2.3 STONE

A. Exterior Stone: To match existing type, color, texture, finish, and appearance.

B. Basis-of-Design Product: Halquist Stone “Forest Bluff” veneer stone.

1. Stone characteristics:

a. Type and color: Lannon split-face (cream, beige) and seam-face (rust).

b. Edges: To match existing.
c. Faces: To match existing.
d. Thickness: 4 inches nominal, unless otherwise indicated.
e. Heights: Varied, to match existing.
f. Lengths: Varied, to match existing.
g. Coursing: To match existing.
h. Finish: 20% Seam-face, 80% Split-face.
i. Joints: Raked, 3/8” to 1/2”.

C. Match existing building for color, finish, and other stone characteristics relating to aesthetic effects.

## 2.4 MORTAR MATERIALS

A. Refer to Section 04 2000 “Unit Masonry”.

B. Water: Potable.

## 2.5 VENEER ANCHORS

A. Refer to Section 04 2000 “Unit Masonry”.

## 2.6 EMBEDDED FLASHING MATERIALS

A. Refer to Section 04 2000 “Unit Masonry”.

## 2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Setting Shims: Strips of resilient plastic or vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.

B. Setting Buttons: Resilient plastic buttons, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of pointing materials.

C. Refer to Section 04 2000 “Unit Masonry” for additional accessories.

D. Joint Sealants: Refer to Section 07 9200 “Joint Sealants”.

## 2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Asphalt Dampproofing: Cut-back asphalt complying with ASTM D4479/D4479M, Type I or asphalt emulsion complying with ASTM D1227, Type III or Type IV.

2.9 MASONRY CLEANERS

A. Proprietary Non-Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry and pigmented mortar surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

2.10 FABRICATION

A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.

B. Select stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.

1. Shape stone specified to be laid in pattern to match existing.

C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.

D. Thickness of Stone: Provide thickness indicated, but not less than the following:

1. Thickness: 3-1/2 inches plus or minus 1/4 inch (6 mm).

E. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples.

1. Finish: To match existing..

2.11 MORTAR MIXES

A. General: Refer to Section 04 2000 “Unit Masonry”.

1. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

B. Mortar for Stone Masonry: Comply with ASTM C270, Property Specification.

1. Mortar for Setting Stone: Type N.
2. Mortar for Pointing Stone: Type N.

C. Pigmented Mortar: Refer to Section 04 2000 “Unit Masonry”.

1. Color: To be selected by Architect from manufacturer’s full range.
2. Application: Use pigmented mortar for exposed mortar joints.

D. General: All mortars shall be factory pre-blended.

1. Preblended, Dry Mortar Mix: Comply with ASTM C1714 and the requirements of this Section. Furnish dry mortar ingredients, including pigments, if any, in the form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
2. Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated. Admixtures shall be designated by their manufacturer as designed specifically for use in mortar.

a. Do not use calcium chloride in mortar.
b. Use portland cement-lime mortar unless otherwise indicated.
c. Do not use admixtures that lower the freezing temperature of mortar.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine surfaces indicated to receive stone masonry, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stone masonry.

B. Examine wall framing, sheathing, and air barrier to verify that stud locations are suitable for spacing of veneer anchors and that installation will result in a weatherproof covering.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Accurately mark stud centerlines on face of air barrier before beginning stone installation.

B. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

C. Coat stone with dampproofing as follows:

1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches above finish-grade elevations.
2. Allow dampproofing formulations to cure before setting dampproofed stone. Do not damage or remove dampproofing in the course of handling and setting stone. Patch and repair dampproofing to provide complete coverage.
3. Dampproofing shall not remain exposed in completed Work.

3.3 INSTALLATION OF STONE MASONRY

A. Perform necessary field cutting and trimming as stone is set.

1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snipping.
2. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.

B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.

C. Arrange stones in patterns to match existing with course heights as indicated and uniform joint widths, with offset between vertical joints as indicated.

D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.

E. Install supports, fasteners, and other attachments indicated or necessary to secure stone masonry in place.

F. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

G. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any.

H. Open Sealant Joints: Open joints, free of mortar and other rigid materials, filled with sealant.

1. Provide open sealant joints at the following locations:
   a. At locations indicated.

2. Construct open sealant joints as follows:

   a. Keep joints free of mortar and other rigid materials.
   b. Build in compressible foam-plastic joint fillers where indicated.
   c. Form joint of width indicated, but not less than 3/8 inch (10 mm).
   d. Prime stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
   e. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 07 9200 "Joint Sealants."

## 3.4 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. Refer to Section 04 2000 “Unit Masonry”.

## 3.5 INSTALLATION OF ANCHORED STONE MASONRY

A. Refer to Section 04 2000 "Unit Masonry" for additional information and general masonry installation requirements.

B. Coordinate installation of anchors with air barrier installation. When anchors are installed after air barrier installation, coordinate repair of air barrier penetrations with Section 07 2726 “Fluid-Applied Membrane Air Barriers”.

C. Anchor stone masonry to stud framing with screw-attached veneer anchors unless otherwise indicated. Fasten anchors through sheathing to framing.

D. Embed veneer anchors in mortar joints of stone masonry at least halfway, but not less than 1-1/2 inches (38 mm), through stone masonry and with at least a 5/8-inch (16-mm) cover on exterior face.

E. Space anchors to provide not less than one anchor per 2 sq. ft. (0.2 sq. m) of wall area. Install additional anchors within 12 inches (300 mm) of openings, sealant joints, and perimeter at intervals not exceeding 12 inches (300 mm).

F. Set stone in full bed of mortar with full head joints unless otherwise indicated. Build anchors into mortar joints as stone is set.

G. Provide 1-inch (25-mm) minimum cavity between stone masonry and backup construction unless otherwise indicated. Keep cavity free of mortar droppings and debris.

1. Slope beds toward cavity to minimize mortar protrusions into cavity.
2. Do not attempt to trowel or remove mortar fins protruding into cavity.

H. Rake out joints for pointing with mortar to depth of not less than 1/2 inch (13 mm) before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

3.6 POINTING

A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch (10 mm) deep until a uniform depth is formed.

B. Point stone joints by placing and compacting pointing mortar in layers of not more than 3/8 inch (10 mm) deep. Compact each layer thoroughly and allow to it become thumbprint hard before applying next layer.

C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:

1. Joint Profile: To match existing.

3.7 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or 1/2 inch in 40 feet (13 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (13 mm in 12 m) or more.

C. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet (13 mm in 6 m) or 3/4 inch in 40 feet (19 mm in 12 m) or more.

D. Measure variation from level, plumb, and position shown in plan as a variation of the average plane of each stone face from level, plumb, or dimensioned plane.

E. Variation in Mortar-Joint Thickness: Do not vary from joint size range indicated.

F. Variation in Plane between Adjacent Stones: Do not exceed one-half of tolerance specified for thickness of stone.

3.8 FIELD QUALITY CONTROL

A. Refer to Section 01 4533 “Special Inspection Requirements” and Section 04 2000 “Unit Masonry”.

3.9 ADJUSTING AND CLEANING

A. Remove and replace stone masonry of the following description:

1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.

a. Sawcut Stone: Patch chipped edges or corners measuring more than 3/4 inch (19 mm) in least dimension.

2. Defective joints.
3. Stone masonry not matching approved samples and mockups.
4. Stone masonry not complying with other requirements indicated.

B. Replace in a manner that results in stone masonry matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.
6. When recommended by stone supplier, clean masonry with a proprietary cleaner applied according to cleaner manufacturer's written instructions.

**END OF SECTION**

## SECTION 05 4000 - COLD-FORMED METAL FRAMING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Cold-formed metal framing for the following:
   1. Exterior non-load-bearing wall framing.

B. Related Requirements:
   1. Section 09 2216 "Non-Structural Metal Framing" for standard, interior non-structural, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.2 COORDINATION

A. Coordinate cold-formed metal framing with cladding and other systems utilizing Work of this Section as support.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Attendees shall include Installer, and subcontractors or material technical service representatives whose work, or products, must be coordinated with the cold-formed steel framing work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings: Prepared by cold-formed metal framing manufacturer or delegated designer.

   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners and loads imposed on the structure.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
   3. Indicate confirmation of coordination with cladding and other systems utilizing Work of this Section as support.
   4. Structural calculations.

C. Delegated Design Submittal: For cold-formed steel framing, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

   1. Steel sheet.
   2. Expansion anchors.

3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips.
7. Miscellaneous structural clips and accessories.

C. Research Reports:

1. For cold-formed steel framing, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
2. For sill sealer gasket, showing compliance with ICC-ES AC380.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall have not less than 5 years' of experience installing work of this Section on projects of similar scope and complexity and one of the following:

1. A project specific manufacturer approval letter from steel stud manufacturer.
2. Installer is recognized in Steel Framing Industry Associations (SFIA) "Contractor Certification Program".

B. Manufacturer Qualifications: Member in good standing of the Steel Framing Industry Association (SFIA) or be a part of a similar organization that provides verifiable code compliance program.

1. Products to be certified under an independent third-party inspection program.

C. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

D. Code-Compliance Certification of Studs and Tracks: Provide documentation upon request that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, the Steel Stud Manufacturers Association, or the Supreme Steel Framing System Association.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CEMCO; California Expanded Metal Products Co.
2. ClarkDietrich.
3. MarinoWARE.
4. MBA Building Supplies.
5. Super Stud Building Products Inc.
6. Telling Industries.
7. The Steel Network, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on the Drawings.

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior and Interior Non-Load-Bearing Framing: Horizontal deflection as a ratio of the wall height:

1) Deflection Limit: L/240 except as follows:
a) L/600 at walls to receive masonry veneer, including CMU, brick, stone, and cast stone.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 1 inch (25 mm).

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and AISI S200 and ASTM C955, Section 8:

2.3 COLD-FORMED STEEL FRAMING MATERIALS

A. Framing Members, General: Comply with AISI S200 and ASTM C955, Section 8 for conditions indicated.

B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: ST33H (ST230H) minimum.
2. Coating:
a. Exterior Walls with Masonry Cladding, CP90: G90 (Z275), AZ50 (AZM150), or GF45 (ZGF135).

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
2. Flange Width: 1-5/8 inches (41 mm).

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0329 inch (0.84 mm).
2. Flange Width: 1-1/4 inches (32 mm).

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ClarkDietrich.
b. MarinoWARE.
c. Simpson Strong-Tie Co., Inc.
d. The Steel Network, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0538 inch (1.37 mm).
2. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures and 1 inch (25 mm) plus twice the design gap for other applications.

## 2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Backer plates.

## 2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Anchor Bolts: ASTM F1554, Grade 36, threaded carbon-steel headless, hooked bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC193, ICC-ES AC58, or ICC-ES AC308] as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.
2. Type: Torque-controlled expansion anchor; torque-controlled adhesive anchor; or adhesive anchor.
3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941 (ASTM F1941M), Class Fe/Zn 5, unless otherwise indicated.

D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M.

B. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch (6 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

2.8 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates, areas, conditions, 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 PREPARATION

A. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

## 3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to ASTM C1007, AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

## 3.4 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches (406 mm) unless otherwise indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support. Provide one or more of the following:

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Connect vertical deflection clips to studs and anchor to building structure.

3. Connect drift clips to cold-formed steel framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches (1220 mm) apart. Fasten at each stud intersection. Provide one or more of the following:

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches (305 mm) of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
2. Bridging: One of the following:

a. Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
b. Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

## 3.5 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

## 3.6 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

## 3.7 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

**END OF SECTION**

## SECTION 05 5000 - METAL FABRICATIONS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous framing and supports.
2. Miscellaneous steel trim.
3. Loose bearing and leveling plates.

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.

C. Related Requirements:
1. Section 04 2000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

1.2 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.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Prefabricated products.

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.

C. Delegated Design Submittals: For metal fabrications, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Certificates:
1. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 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. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design metal fabrications.

B. Structural Performance: Metal fabrications shall withstand the design loads within limits and under conditions determined according to the IBC.

1. Design Loads: As indicated on Drawings.

C. Thermal Movements for Exterior Metal Fabrications: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), 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. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

E. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

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 (ISO 898-1, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

D. 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.

E. Post-Installed Anchors: Torque-controlled expansion anchors or chemical 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 (A1) stainless steel bolts, ASTM F593 (ISO 3506-1), and nuts, ASTM F594 (ASTM F836M).

## 2.4 MISCELLANEOUS MATERIALS

A. Primers:

1. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
2. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

E. 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.

## 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 (1 mm) 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 (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) 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. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports indicated to be embedded in concrete and masonry, located in exterior walls and similar locations, and where indicated.

D. Prime miscellaneous framing and supports that are not galvanized, and where indicated to receive a painted finish.

## 2.7 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim, and where indicated.

D. Prime miscellaneous steel trim that is not galvanized, and where indicated to receive a painted finish.

## 2.8 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. Galvanize bearing and leveling plates.

C. Prime plates where indicated to receive a painted finish.

## 2.9 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.

## 2.10 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum offset between faces: 1/16 inch.

C. Maximum misalignment of adjacent members: 1/16 inch.

D. Maximum bow: 1/8 inch in 48 inches.

E. Maximum deviation from plane: 1/16 inch in 48 inches.

## 2.11 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize indicated items after fabrication to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.

1. For items indicated to be painted, 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 unless they are to be embedded in concrete or masonry, or unless otherwise indicated.

1. Coordination:

a. Coordinate shop primer product with spray-applied fire-resistive material, Section 07 8100 “Applied Fire Protection” manufacturer to ensure adhesion and compatibility.
b. Coordinate shop primer product with Section 07 8123 “Intumescent Fire Protection” manufacturer to ensure adhesion and compatibility.

2. Galvanized items shall be shop primed when indicated to receive painted finish.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Primers Specified in Section 09 9600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
4. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

E. 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.

## 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.

F. Corrosion Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

### 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.

### 3.3 INSTALLATION OF LOOSE 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.

### 3.4 INSTALLATION TOLERANCES

A. Maximum variation from plumb: 1/4 inch per story, non-cumulative.

B. Maximum offset from true alignment: 1/4 inch.

C. Maximum out-of-position: 1/4 inch.

3.5 REPAIR

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 (0.05-mm) dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

**END OF SECTION**

## SECTION 05 7300 - DECORATIVE METAL RAILINGS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Steel and iron decorative railings.

1.2 COORDINATION AND SCHEDULING

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.

B. Coordinate installation of anchorages for railings. 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 items to Project site in time for installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of decorative metal railings assembled from standard components.
2. Fasteners.
3. Post-installed anchors.
4. Shop primer.
5. Intermediate coats and topcoats.

B. Shop Drawings: Include plans, elevations, sections, and attachment details.

1. For illuminated railings, include wiring diagrams and roughing-in details.

C. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters
2. Fittings, end caps, and brackets.
3. Welded connections.
4. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and guard infill. Sample need not be full height.

a. Show method of connecting and finishing members at intersections.

D. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For delegated design professional engineer.

B. Welding certificates.

C. 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."

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
1. Build mockups for each form and finish of railing, consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

**PART 2 - PRODUCTS**

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, are to withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

## 2.3 STEEL AND IRON DECORATIVE RAILINGS

A. Source Limitations: Obtain steel decorative railing components from single source from single manufacturer.

B. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M, Type 5.

C. Bars: Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.

D. Plates, Shapes, and Bars: ASTM A36/A36M.

E. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

## 2.4 FASTENERS

A. Fastener Materials:
1. Ungalvanized-Steel Railing Components: Plated-steel fasteners complying with ASTM F1941/F1941M, Class Fe/Zn 5 for electrodeposited zinc coating where concealed; Type 304 stainless steel fasteners where exposed.
2. Hot-Dip Galvanized-Steel Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
3. Dissimilar Metal Railing Components: Type 304 stainless steel fasteners.
4. Finish exposed fasteners to match appearance, including color and texture, of railings.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.

1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193.
1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F593 and nuts, ASTM F594.

## 2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Etching Cleaner for Galvanized Metal: Compatible with coating system specified.

C. Galvanizing Repair Paint: High-zinc-dust-content paint compatible with coating system specified.

D. Shop Primers: Provide primers that comply with Section 09 9113 "Exterior Painting."

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

E. Shop Primer for Galvanized Steel: Cementitious galvanized metal primer.

F. Intermediate Coats and Topcoats: Provide products that comply with Section 09 9113 "Exterior Painting."

G. Epoxy Intermediate Coat: Compatible with primer and topcoat.

H. Polyurethane Topcoat: Compatible with undercoat.

I. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

## 2.6 FABRICATION

A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water.

1. Provide weep holes where water may accumulate.
2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

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 flux immediately.

4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.

1. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
2. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:

1. As detailed.

K. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.

N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry Work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

## 2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

## 2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner and as follows:

1. Comply with SSPC-SP 16.

2. Exterior Railings: SSPC-SP 6/NACE No. 3.

D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

E. Powder-Coat Finish for Galvanized Metal: Prepare, treat, and coat galvanized metal to comply with resin manufacturer's written instructions and as follows:

1. Prepare galvanized metal by thoroughly removing grease, dirt, oil, flux, and other foreign matter.
2. Treat prepared metal with zinc-phosphate pretreatment, rinse, and seal surfaces.
3. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness of not less than 1.5 mils (0.04 mm).
4. Color: Match Architect's sample.

**PART 3 - EXECUTION**

3.1 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3 m).

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.2 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

3.3 ANCHORING POSTS

A. Anchor posts to surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
1. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.

3.4 ATTACHING RAILINGS

A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends, using nonwelded connections.

3.5 REPAIR

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material 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 (0.05-mm) dry film thickness.

2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 9113 "Exterior Painting."

3.6 CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

**END OF SECTION**

## SECTION 06 1053 – MISCELLANEOUS ROUGH CARPENTRY

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood-preservative-treated lumber.
2. Fire-retardant-treated lumber.
3. Miscellaneous lumber.
4. Plywood backing panels.

B. Related Requirements:
1. Section 09 2216 “Non-Structural Metal Framing” for wood backing plate assembly and metal sheeting used as blocking.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal (38 mm actual) size or greater but less than 5 inches nominal (114 mm actual) size in least dimension.

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. Wood-Preservative Treatments: Include data 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.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES or similar organization acceptable to authorities having jurisdiction:

1. Preservative-treated wood.
2. Power-driven fasteners.
3. Post-installed anchors.

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: Comply with 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. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal (38-mm actual) thickness or less, 19 percent for more than 2-inch nominal (38-mm actual) thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1.

1. Use categories as follows:

a. UC2: Interior construction not in contact with ground.
b. UC4A: Items installed less than 6 inches above the ground or in contact with ground

2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

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.

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, stripping, 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 (460 mm) above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.
6. Wood nailers, blocking, and similar members in connection with roofing and roof flashing are <u>not</u> required to be treated unless indicated on Drawings or are in direct contact with masonry or concrete.

2.3 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

2. Nailers.
3. Cants.
4. Furring.
5. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. Concealed Boards: Construction or No. 2 grade lumber of any species with 19 percent maximum moisture content.

D. Roofing Blocking and Nailers: Structural- or No. 2-grade lumber or better; kiln-dried Douglas fir, southern pine, or wood having similar decay-resistant properties.

E. 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.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

## 2.4 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 (19-mm) nominal thickness.

## 2.5 FASTENERS

A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

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. 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.

## 2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.

1. Interior-applied adhesives shall have a VOC content of 70 g/L or less.

## PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set work 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, grounds, and similar supports to comply with requirements for attaching other construction.

B. 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.

C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Install supplementary framing and blocking to support fixtures, equipment services, heavy trim, door stops, grab bars, toilet accessories, furnishings, and similar construction.
2. 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 (406 mm) o.c.

D. 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 (2438 mm) 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 (2438 mm) 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 (38-mm actual) 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. (9.3 sq. m) and to solidly fill space below partitions.

E. 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.

F. 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.

G. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC) .
2. ICC-ES evaluation report for fastener.
3. Anchor roof blocking and nailers in accordance with roof system performance requirements, ASCE/SEI 7, ANSI/SPRI ED-1, and FM Global Property Loss Prevention Data Sheet 1-49, whichever is most stringent. Refer to Division 07 roofing specifications for additional requirements.

I. 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.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

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 wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 INSTALLATION OF WOOD FURRING

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 Gypsum Board or Plaster Lath: Install 1-by-2-inch nominal- (19-by-38-mm actual-) size furring vertically at 16 inches (406 mm) o.c. unless indicated otherwise.

3.4 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.

**END OF SECTION**

## SECTION 06 1643 – EXTERIOR GYPSUM SHEATHING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior gypsum wall and soffit sheathing.

B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for plywood backing panels.
2. Section 07 2500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

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 EXTERIOR GYPSUM SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C1177/C1177M.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corporation; GlasRoc.
b. Georgia-Pacific Gypsum LLC; DensGlass Sheathing.
c. National Gypsum Company; Gold Bond eXP Sheathing.
d. USG Corporation; Securock.

2. Type and Thickness: Type X, 5/8 inch thick.

2.2 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours in accordance with ASTM B117.

B. Screws for Fastening Gypsum Sheathing to Wood Framing: ASTM C1002.

C. 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.

## 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. ICC-ES evaluation report for fastener.

D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or UV-exposure exceeding sheathing manufacturer’s written recommendations.

### 3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253, ASTM C1280, and with manufacturer's written instructions.
1. Fasten gypsum sheathing to metal framing with screws.
2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. 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: Apply panels perpendicular to studs. Abut panel 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.

D. Vertical Installation: Install vertical edges of panels 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.

**END OF SECTION**

## SECTION 06 2013 - EXTERIOR FINISH CARPENTRY

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior trim.

1.2 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.

3. For each species and cut of lumber and panel products, with half of exposed surface finished; 50 sq. in. (300 sq. cm) for lumber.

1.3 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

1. For lumber that is not marked with grade stamp.
2. For preservative-treated wood that is not marked with treatment-quality mark.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.

C. Sample Warranties: For manufacturer's warranties.

1.4 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.

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

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 inspection agency, indicating grade, species, moisture content at time of surfacing, and mill.
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 inspection agency.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Water-Repellent Preservative Treatment by Nonpressure Process: AWPA N1; dip, spray, flood, or vacuum-pressure treatment.

1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC).
2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
3. Application: Exterior trim.

B. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3a.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
2. Preservative Chemicals: Acceptable to authorities having jurisdiction.
3. Do not use material that is warped or does not comply with requirements for untreated material.
4. Mark lumber with treatment-quality mark of an inspection agency approved by the ALSC's Board of Review.

2.3 EXTERIOR TRIM

A. Lumber Trim for Opaque Finish (Painted Finish):

1. Species and Grade:
   a. Hem-fir; NLGA, WCLIB, or WWPA Prime or D finish.
   b. Eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods; NeLMA, NLGA, WCLIB, or WWPA D Select (Quality).

2. Maximum Moisture Content: 19 percent.
3. Face Surface: Surfaced (smooth).

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

1. For face-fastening siding, provide ringed-shank siding nails or hot-dip galvanized-steel siding nails.
2. For applications not otherwise indicated, provide hot-dip galvanized-steel fasteners.

B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

C. Sealants: Latex, complying with ASTM C834 and applicable requirements in Section 07 9200 "Joint Sealants," and recommended by sealant and substrate manufacturers for intended application.

2.5 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches (125 mm), except members with ends exposed in finished work.

B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) 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. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed.

1. Cut to required lengths and prime ends.
2. Comply with requirements in Section 09 9113 "Exterior Painting."

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials.

1. Use concealed shims where necessary for alignment.
2. Scribe and cut exterior finish carpentry to fit adjoining work.

3. Refinish and seal cuts as recommended by manufacturer.
4. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
5. Coordinate exterior finish carpentry with materials and systems in or adjacent to it.
6. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

## 3.4 INSTALLATION OF STANDING AND RUNNING TRIM

A. Install flat-grain lumber with bark side exposed to weather.

B. Install cellular PVC trim to comply with manufacturer's written instructions.

C. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary.

1. Use scarf joints for end-to-end joints.
2. Stagger end joints in adjacent and related members.

D. Fit exterior joints to exclude water.

1. Cope at returns and miter at corners to produce tight-fitting joints, with full-surface contact throughout length of joint.
2. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

E. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

## 3.5 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements.

1. Exterior 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.

## 3.6 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

## 3.7 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**

## SECTION 06 4116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Plastic-laminate-clad architectural cabinets.
2. Miscellaneous materials.

B. Related Requirements:
1. Section 06 1053 "Miscellaneous 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 09 2216 "Non-Structural Metal Framing" for blocking, strapping, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
3. Section 12 3661.16 "Solid Surfacing Countertops."

1.2 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.

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. 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.

C. Samples for Verification: For the following:
1. Plastic Laminates: 12 by 12 inches, for each type, color, pattern, and surface finish required.

   a. Fabrication Sample: Provide one sample applied to core material with specified edge material applied to two adjoining edges.
2. Thermally Fused Laminate Panels: 12 by 12 inches, for each color, pattern, and surface finish.

   a. Fabrication Sample: Provide one sample applied to core material with specified edge material applied to two adjoining edges.
3. Corner Pieces:

   a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
   b. Miter joints for standing trim.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Certificates: For the following:
   1. Certification from manufacturer that Work of this Section complies with requirements of this Section, including indicated AWI standards.

C. Fabrication Test Reports: For each type of casework, structural performance tests performed by independent qualified testing agency indicating compliance with specified requirements.

1.6 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. Engage a firm with not less than 5 years' successful experience in producing casework similar in quantity and complexity to that shown on Drawings and specified herein.

B. Installer Qualifications: Manufacturer of products or an experienced installer hired directly by manufacturer with at least 5 years' experience installing cabinetry.

1.7 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.

1.8 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. 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.

C. 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 GENERAL

A. Quality Standard: Unless otherwise indicated, comply with AWI Standards current edition (AWI) for grades of work indicated for construction, finishes, installation, and other requirements.
   1. 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. High-Pressure Decorative Laminate – PL, **PL-01**: ISO 4586-3, grades as indicated or if not indicated, as required by quality standard.
   1. Basis-of-Design Product: Wilsonart

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. PL-01: Refer to Room Finish Material Key on Drawings.

## 2.2 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. AWI Grade: Custom.
   1. Structural Performance: Not less than Duty Level 2.

B. Type of Construction: Frameless.

C. Door and Drawer-Front Style: Flush overlay.

D. Laminate Cladding for Exposed Surfaces:
   1. Exposed Surfaces Definition: In addition to AWS definition, exposed surfaces include all surfaces of light valances on the underside of wall hung cabinets.
   2. Core Material: MDF or particleboard.
   3. Horizontal Surfaces: Grade HGS.
   4. Postformed Surfaces: Grade HGP.
   5. Vertical Surfaces: Grade HGS.
   6. Cabinet Edges: PVC tape, 0.018-inch (0.460-mm) minimum thickness, matching laminate in color, pattern, and finish.
   7. Shelf, Door, and Drawer Edges: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
   8. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.

E. Materials for Semi-Exposed Surfaces:
   1. Core Material: MDF, particleboard, or plywood.
   2. Shelves: Thermally fused laminate panels.
      a. Edges of Thermally Fused Laminate Panel Shelves: PVC or polyester edge banding. Apply to all edges of adjustable shelves.
   3. Drawers:

      a. Drawer Sides and Backs: Thermally fused laminate panels with PVC or polyester edge banding.
      b. Drawer Bottoms: Thermally fused laminate panels.
   4. Other Surfaces: Thermally fused laminate panels.

      a. For semi-exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, ISO 4586-3, Grade VGS.

F. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

G. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

H. 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 doweled joints or glued dovetail joints.

## 2.3 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 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. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
   2. Particleboard (Medium Density): ANSI A208.1, Grade M-2.
   3. Softwood Plywood: DOC PS 1.
   4. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of ISO 4586-3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

      a. Colors and Patterns: As selected by Architect from manufacturer's full range.

## 2.4 CABINET HARDWARE AND ACCESSORIES

A. General:

B. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, not less than 110 degrees of opening, self-closing.
   1. Provide two hinges for doors up to 36 inches high.
   2. Provide three hinges for doors more than 36 inches high or more than 24 inches wide.
   3. Provide four hinges for doors more than 60 inches high.

C. Back-Mounted Pulls: ANSI/BHMA A156.9, B02011.

D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

E. Catches: Magnetic catches, ANSI/BHMA A156.9, B03141.

F. Shelf Rests: ANSI/BHMA A156.9, B04013; metal two-pin type with shelf hold-down clip.

G. Drawer Slides: ANSI/BHMA A156.9.
   1. General: Side mounted; full-extension type unless otherwise indicated; zinc-plated-steel ball-bearing slides; with hold-in detent.
   2. For drawers up to 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
   3. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
   4. For computer keyboard shelves, provide Grade 1HD-100.
   5. For trash bins not more than 20 inches high and 16 inches wide, provide Grade 1HD-200.
   6. For lateral file drawers, provide Grade 1HD-200 with full-overtravel-extension.

H. Door and Drawer Locks: Refer to Drawings for locations and types.

I. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.

J. Lateral File Drawer Hardware: Provide file folder hanging bars and associated hardware at lateral file drawers.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.
   1. As noted on drawings.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood 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. 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 – GENERAL

A. AWI Grade: Install work of this Section to comply with same quality standard grade of item to be installed.
   1. Anchorage: Comply with AWI “Installation Guidelines – Casework Wall Anchorage”.

B. Install items of this Section level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches.

3.3 INSTALLATION OF CABINETS

A. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

B. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

C. 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. using one of the following:

a. No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood blocking, framing, or hanging strips.
b. No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

3.4 INSTALLATION OF GENERAL SHELVING

A. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 16 inches o.c. and within 6 inches of end of shelves. Fasten to framing members or in-wall blocking.

B. Install shelves, fully seated on brackets. Install shelf seats and shelf joiners. Anchor shelves to brackets.

3.5 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**

## SECTION 07 0150.19 - PREPARATION FOR REROOFING

### PART 1 - GENERAL

1.1 SUMMARY

A. The Work of This Section is limited to the roof above the entry vestibule and includes:

1. Full roof tear-off.
2. Base flashing removal.
3. Fastener pull-out testing.
4. Disposal.

B. Related Requirements:

1. Section 01 1000 "Summary" for use of premises and for phasing requirements.
2. Section 01 5000 "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.

1.2 DEFINITIONS

A. EPS: Molded (expanded) polystyrene.

B. Full Roof Tear-off: Removal of existing roofing system down to existing roof deck.

C. OSB: Oriented strand board.

D. Partial Roof Tear-off: Removal of selected components and accessories from existing roofing system.

1.3 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, roofing system manufacturer's representative, roofing Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories.
2. Review methods and procedures related to 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. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
d. Existing roof deck conditions requiring Architect notification.
e. Existing roof deck removal procedures and Owner notifications.
f. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
g. Structural loading limitations of roof deck during reroofing.
h. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
i. Asbestos removal and discovery of asbestos-containing materials.
j. Existing conditions that may require Architect notification before proceeding.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field Test Reports: Fastener pull-out test report.

1. Submit existing conditions before Work begins.

1.6 FIELD CONDITIONS

A. Existing Roofing System: EPDM roofing; verify in field.

B. Owner will not occupy portions of building immediately below reroofing 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.

F. Limit construction loads on existing roof areas to remain.

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:

1. It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.

2. 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.

**PART 2 - PRODUCTS**

2.1 INFILL AND REPLACEMENT MATERIALS

A. Use infill materials matching existing roofing system materials unless otherwise indicated.

B. Wood blocking, curbs, and nailers are specified in Section 06 1053 “Miscellaneous Rough Carpentry".

C. Plywood roof sheathing is specified in Section 06 1600 "Sheathing."

D. Fasteners: Factory-coated steel fasteners with metal or plastic plates listed in FM Approvals' RoofNav, and acceptable to new roofing system manufacturer.

2.2 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing system.

**PART 3 - EXECUTION**

3.1 PREPARATION

A. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

3.2 ROOF TEAR-OFF

A. Notify Owner each day of extent of roof tear-off proposed for that day.

B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other means of removing materials from roof areas acceptable to authorities having jurisdiction.

C. Full Roof Tear-off: Remove existing roofing and other roofing system components down to the existing roof deck.

1. Remove roof insulation.
2. Remove base flashings and counter flashings.
3. Remove perimeter edge flashing and gravel stops.
4. Remove wood blocking, curbs, and nailers.

a. Remove unadhered bitumen, unadhered felts, and wet felts.

5. Remove fasteners from deck or cut fasteners off flush with deck surface.

3.3 DECK PREPARATION

A. Inspect deck after tear-off of roofing system.

1. Refer to Section 07 5323 “Ethylene-Propylene-Diene-Monomer (EPDM) Roofing” for acceptance inspection of deck.

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. Replace plywood roof sheathing as directed by Architect.

3.4 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.

1. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish as existing.

3.5 FASTENER PULL-OUT TESTING

A. Perform fastener pull-out tests according to SPRI FX-1, and submit test report to Architect and roofing manufacturer before installing new roofing system.

1. Obtain roofing manufacturer's approval to proceed with specified fastening pattern.

a. Roofing manufacturer may furnish revised fastening pattern commensurate with pull-out test results.

B. Take photographs of existing deck and parapet conditions to accurately record physical conditions at completion of demolition.

3.6 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**

## SECTION 07 2119 - FOAMED-IN-PLACE INSULATION

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Closed-cell spray polyurethane foam insulation for general wall application.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meeting shall include the following attendees:

a. Owner’s Representative.
b. Architect.
c. Installer.
d. Installers of other construction connecting to thermal envelope, including air barriers, roofing, waterproofing, masonry, wall cladding, sealants, windows, glazed curtain walls, and door frames.
e. Testing agency.

2. Review insulation requirements and installation, surface preparation, substrate condition, minimum substrate curing period, forecasted weather conditions, special details, mockups, testing and inspection procedures, protection and repairs, and work scheduling that covers/conceals insulation.
3. Review submittals.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For Installer.

B. Product Certificates:

1. Spray Foam Insulation Certificate: Certification from spray foam insulation manufacturer that submitted thermal barrier is acceptable for use over their product.
2. Spray Foam Insulation Thermal Barrier Certificate: Certification from thermal barrier manufacturer that submitted product complies with indicated code requirements.

C. Research Reports: For foam-plastic insulation and thermal barriers, from ICC-ES or similar agency acceptable to authorities having jurisdiction.

D. Installer's Certification: Listing type, manufacturer, installed thickness, and R-value of insulation installed in each element of the building thermal envelope.

1. Sign, date, and post the certification in a conspicuous location on Project site.

E. Field Quality-Control Submittals:

1. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Installing individual shall have a minimum of 3 years' experience installing work of this Section and have successfully completed at least 10 projects of similar scale and complexity.

**PART 2 - PRODUCTS**

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Spray Polyurethane Foam: ASTM C1029, Type II, sprayed-in-place, formaldehyde-free, and CFC-free.

1. Basis-of-Design Product: BASF, "Walltite". Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

a. BASF Corporation.
b. Carlisle Spray Foam Insulation.
c. Gaco; Holcim Building Envelope.
d. Huntsman Building Solutions (formerly Demilec, Icynene, Lapolla).
e. Johns Manville; a Berkshire Hathaway company.

2. Density: 1.8 lb/cu. ft. minimum.
3. Thermal Resistance: Aged R-Value per inch of thickness, ASTM C518, 6.2 minimum.
4. Closed Cell Content: 90 percent minimum, ASTM D6226.
5. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E2178.
6. Water Vapor Permeability: 1.5 perm-in, maximum, ASTM E96.
7. Surface-Burning Characteristics: Comply with ASTM E84; 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.

8. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
9. UV Resistance: Can be exposed to sunlight for 30 days according to manufacturer's written instructions.

2.2 ACCESSORIES

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

B. Termination Angles: Thermally-efficient, non-metallic composite angles, compatible with spray foam insulation.

1. Basis-of-Design Product: Advanced Architectural Product, Smartci Systems, "SMARTci Trim".

C. Thermal Barrier: Material barrier intended to prevent flame-source access to foam and delay temperature-rise of foam during a fire event.

1. Thermal Barrier Coating: Fire-protective intumescent coating formulated for application over polyurethane foam plastics, compatible with insulation, and passes NFPA 275 testing as part of an approved assembly.

a. Manufacturer/Product: Products shall comply with indicated requirements and shall be approved in writing by manufacturer of spray foam insulation as acceptable for use with the specified insulation.

**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 concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture as recommended by manufacturer, but not less than plastic sheet method in accordance with ASTM D4263.
4. Verify that masonry joints are flush and completely filled with mortar.
5. Verify penetrating work by other trades is in place and complete.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare substrates according to manufacturer's written instructions.

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.

C. Mask off adjoining surfaces not covered by insulation to prevent spillage and overspray affecting other construction.

3.3 INSTALLATION

A. General: Comply with insulation manufacturer's written instructions applicable to products and applications.

1. Spray insulation to envelop entire area to be insulated and fill voids.
2. Do not apply spray insulation where it will be in contact with equipment or materials with operating temperatures of 180 degrees F. or greater.
3. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. A pass shall not exceed 2 inches. No more than a 4-inch thickness shall be applied in a single day. Do not spray into rising foam.

a. Insulation shall be applied to uniform cured thickness without voids, skips, or holidays.
b. Install within manufacturer’s tolerances, but not greater than minus 1/8 inch or plus 3/8 inch.

4. Finished surface of foam insulation to be free of voids and embedded foreign objects.

B. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.

C. Miscellaneous Voids: Apply according to manufacturer's written instructions.

D. Thermal Barrier Coating: Unless otherwise indicated, apply thermal barrier to the interior surface of the sprayed foam insulation to provide a complete fire-separation of the interior of the building from the sprayed foam insulation.

1. Do not cover insulation prior to any required spray foam insulation inspections.
2. Apply barrier coatings in accordance with manufacturer's written instructions and to comply with requirements for listing and labeling for fire-propagation characteristics and surface-burning characteristics specified.
3. Use equipment and techniques best suited for substrate and type of material applied as recommended by coating manufacturer.
4. Apply coatings to prepared surfaces as soon as practical after preparation and before subsequent surface soiling or deterioration.
5. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Produce sharp lines and color breaks.

## 3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect spray foam insulation installation, including accessories. Report results in writing.

## 3.5 PROTECTION

A. Protect installed insulation from damage during application and remainder of construction period, according to manufacturer's written instructions. Protect from damage due to harmful weather exposures, physical abuse, and other causes.

1. Protect insulation from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed for a period of time in excess of manufacturer’s written instructions, or more than 60 days, whichever period of time is less, remove and replace insulation.
2. Protect insulation from contact with incompatible materials and sealants not approved by insulation manufacturer.
3. Insulation that is wet or becomes damaged shall be removed and replaced with new materials.

**END OF SECTION**

## SECTION 07 2500 - WEATHER BARRIERS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wrap, identified as “air barrier” on Drawings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product and accessory.

1. For building wrap, include data on air and water-vapor permeance based on testing in accordance with referenced standards.

B. Shop Drawings: Show details of building wrap at terminations, openings, penetrations, inside and outside corners, and tie-ins with adjoining construction. Show details of flexible flashing applications.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.

1.3 INFORMATIONAL SUBMITTALS

A. Installation Instructions: Manufacturer’s written instructions for each type of product and accessory.

B. Evaluation Reports: For water-resistive barrier and accessories, from ICC-ES or similar organization acceptable to authorities having jurisdiction.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, certified, or licensed by the weather barrier system manufacturer to install manufacturer's product and have a minimum of 5 years’ experience installing work of this Section and have successfully completed at least 5 projects of similar scale and complexity to this Project.

B. Training: A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of air barriers to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

1. Manufacturer’s representative shall be available on-site for subsequent visits upon request.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. The water-resistive barrier shall function as the primary air barrier.

B. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction to 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 to 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.

1. Air barrier installation shall comply with manufacturer's "high performance" and "best practices" requirements.
2. Air barrier shall be applied over all substrates in exterior wall construction. A minimum 3-inch width lap is required onto all adjoining substrates and materials, but no portion of the barrier shall remain exposed to view.
3. Unless indicated otherwise, connections shall be made between:

   a. Foundation and walls.
   b. Walls and fenestration (windows, doors, storefront, louvers, etc.).
   c. Different wall systems.

4. The air-barrier system shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
5. The air-barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep.

C. 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 E2357.

### 2.2 WEATHER BARRIERS

A. Source Limitations: Obtain water-resistive barrier materials and accessories from single source from single manufacturer or materials and sources approved by water-resistive barrier manufacturer.

B. Building Wrap: Air barrier; UV stabilized; and acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide the following:

   a. DuPont, DuPont de Nemours, Inc.; "Tyvek Commercial Wrap".
   b. Henry Company, "Blueskin VP160" (self-adhered).
   c. VaproShield LLC; "WrapShield IT".

2. Water-Vapor Permeance: Minimum 20 perms (1150 ng/Pa x s x sq. m) and not more than 30 perms in accordance with ASTM E96/E96M, Desiccant Method (Procedure A).
3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg (0.02 L/s x sq. m at 75 Pa) when tested in accordance with ASTM E2178.
4. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than Class A, 25 and 450 when tested in accordance with ASTM E84.
5. Allowable UV Exposure Time: Not less than 180 days.
6. Flame Propagation Test: Materials and construction to be as tested in accordance with NFPA 285.

C. Accessories: Provide fasteners, primers, transition strips, termination strips, joint sealants, counterflashing strips, flashing sheets, 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.

1. Primary accessory materials shall be vapor-permeable.

**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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF WEATHER BARRIERS

A. General: Install water-resistive barrier and accessories in accordance with manufacturer's written instructions. Installation shall comply with manufacturer's "high performance" and "best practices" requirements. A complete set of written instructions shall be available on-site at all times during installation.

1. Apply sheets in a shingled manner to shed water.
2. Install water-resistive barrier and accessory materials to form a seal with adjacent construction and to maintain a continuous air barrier.
3. Connect and seal exterior wall air-barrier 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.

B. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.

C. Adhered flashings and membranes shall be rolled with a hard rubber or metal roller to ensure complete adhesion to substrates.

3.3 FIELD QUALITY CONTROL

A. Field Inspections: Manufacturer's field representative shall be present on site as follows:
1. Final System Inspection: Inspect air barrier installation upon completion prior to cladding installation.

3.4 ADJUSTING AND REPAIRS

A. Penetrations and damage of the water-resistive barrier following the membrane installation shall be sealed prior to concealment or installation of cladding. Penetrations include, but are not limited to, the following:

1. Pipes and conduits.
2. Fasteners, temporary and permanent.

B. Penetrations/Damage Repair: Perform repair work in accordance with water-resistive barrier manufacturer's recommendations.

3.5 PROTECTION

A. Protect water-resistive 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 for a period of time in excess of manufacturer’s written instructions, or more than 120 days, whichever period of time is less, repair or replace water-resistive barrier according to air-barrier manufacturer's written instructions.
2. Protect water-resistive barrier from contact with incompatible materials and sealants not approved by water-resistive barrier manufacturer.

**END OF SECTION**

## SECTION 07 4646 - FIBER-CEMENT SIDING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fiber-cement siding.

B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring, grounds, nailers, and blocking.

1.2 COORDINATION

A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples for Verification: For each type, color, texture, and pattern required. For each sample, provide specified treatment for exposed cut edges.
1. Panel Siding: 6 inches square.
2. Trim: 12-inch-long-by-actual-width.

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fiber-cement siding.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.

C. Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES or other qualified agency acceptable to authorities having jurisdiction.

D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
   1. Build mockups for fiber-cement siding including accessories.

      a. Size: 48 inches (1200 mm) long by 60 inches (1800 mm) high.
      b. Include outside corner on one end of mockup.

   2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Structural failures including cracking and deforming.
      b. Deterioration of materials beyond normal weathering.

   2. Siding Warranty Period: 30 years from date of Substantial Completion.
   3. Trim Warranty Period: 15 years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

   1. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 5 Hunter color-difference units as measured according to ASTM D2244.
   2. Warranty Period: 15 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SIDING

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Products shall be factory-finished unless otherwise indicated.

B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Fiber-Cement Panel Siding:

1. Basis-of-Design Product: James Hardie, “HardiePanel Vertical Siding type HZ5”.
2. Nominal Thickness: Not less than 5/16 inch.
3. Panel Texture: “Smooth”.
4. Panel Color, Factory-Finished: As selected by Architect from manufacturer’sfull range of standard colors.

D. Fiber-Cement Siding Trim:

1. Basis-of-Design Product: James Hardie, “HardieTrim, type HZ5”.
2. Nominal Thickness: 3/4 inch.
3. Texture: Smooth.
4. Sizes: As indicated on Drawings.
5. Color, Factory-Finished: “Arctic White”.

E. Fiber-Cement Siding Trim:

1. Basis-of-Design Product: James Hardie, “HardieTrim 5/4 NT3, type HZ5”.
2. Nominal Thickness: 1 inch.
3. Widths: 3.5 and 11.25 inches.
4. Texture: Smooth.
5. Color, Factory-Finished: As selected by Architect from manufacturer’s full range of standard colors.

## 2.3 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Flashing: Provide flashing complying with Section 07 6200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated; exposed flashing color to match siding.

C. Fasteners: Provide the following fasteners unless otherwise recommended by siding manufacturer.

1. For fastening to wood, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch (6 mm), or three screw-threads, into substrate.
3. For fastening fiber cement, use hot-dip galvanized or stainless-steel fasteners.
4. Exposed Fasteners: Head color to match siding.

D. Factory Finish Touch Up Kit: Provide paint touch-up kit for each factory finish color selected.

E. Elastomeric Joint Sealant: Provide fiber cement manufacturer’s recommended non-sag latex joint sealant complying with requirements in Section 07 9200 “Joint Sealants”; exposed sealant color to match siding.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and related accessories.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by siding manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by siding manufacturer.

    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating siding to verify actual locations of penetrations relative to joint locations of siding before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

### 3.3 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
2. Install fasteners no more than 24 inches (600 mm) o.c.
3. Conceal fasteners to maximum extent possible.
4. Finish cut edges to match panel faces prior to installation.

B. Install joint sealants as specified in Section 07 9200 "Joint Sealants" and to produce a weathertight installation.

### 3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

C. Replace siding that has been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION**

## SECTION 07 5323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered ethylene-propylene-diene-terpolymer (EPDM) roofing system.
2. Accessory roofing materials.
3. Roof insulation.

B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 6200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
3. Section 07 9200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of SPRI's Directory of Roof Assemblies listing.

B. Roof System Assembly Letter: An executive summary by the system manufacturer identifying each system component of each type of roof assembly with product names and basic characteristics.

C. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Roof plan showing detail locations.
2. Layout and thickness of insulation.
3. Tapered insulation, thickness, and slopes.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
5. Base flashings and membrane terminations.
6. Flashing details at penetrations.
7. Roof plan showing orientation of steel roof deck and orientation of roof membrane and fastening spacings and patterns for mechanically fastened roofing system.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system, including wind uplift performance, complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of complying with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For components of roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES or other qualified agency acceptable to authorities having jurisdiction.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's and installer’s special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturers: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

a. Manufacturer shall be the primary manufacturer of the roof membrane and have non-sales, technical representatives available on-site upon request.

2. Installers: A qualified firm that is certified or licensed by roofing system manufacturer for a minimum of 3 continuous years to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

B. Roofing installation shall comply with NRCA's "The NRCA Roofing Manual: Membrane Roof Systems". In case of conflict between the NRCA Manual and the Contract Documents, the Contractor shall notify the Architect in writing before proceeding with the work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.9 FIELD 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.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, and other components of roofing system.
2. Special warranty includes wind speed coverage for peak gusts of not less than 72 mph.
3. Warranty Period: 20 years from Date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carlisle SynTec Incorporated.
2. Elevate (formerly Firestone); Holcim Building Envelope.
3. Johns Manville
4. Versico Incorporated.

B. Source Limitations: Obtain components including roof insulation and fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and base flashings to withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and flashings to remain watertight.

1. Accelerated Weathering: Roof membrane to withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane to resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials to be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:

1. As indicated on Drawings.

D. SPRI's Directory of Roof Assemblies Listing: Roof membrane, base flashings, and component materials comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and are listed in SPRI's Directory of Roof Assemblies for roof assembly identical for that specified for this Project.

1. Wind Uplift Load Capacity: As indicated on drawings.

E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

## 2.3 ETHYLENE-PROPYLENE-DIENE-TERPOLYMER (EPDM) ROOFING

A. EPDM Sheet: ASTM D4637/D4637M, Type I, nonreinforced, self-adhering EPDM sheet.
1. Thickness: 60 mils (1.5 mm), nominal.
2. Exposed Face Color: Black.

## 2.4 ACCESSORY ROOFING MATERIALS

A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil- (1.5-mm-) thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Seaming Material: Manufacturer's standard, factory applied synthetic-rubber polymer primer and 6-inch-(150-mm-) wide minimum, butyl splice tape with release film.

E. Lap Sealant: Manufacturer's standard, single-component sealant, colored to match membrane roofing.

F. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

G. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

H. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced EPDM securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.5 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by EPDM roof membrane manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat on both major surfaces.

1. Overall Insulation Thickness: As indicated on Drawings.
2. Board Thickness Per Layer: Install insulation in not less than 2 layers. Adhered insulation shall not exceed 2-1/2 inches per layer.
3. Thermal Resistance: R-value of 5.6 per inch minimum per ASTM C518, LTTR.
4. Board Edges: Square.

C. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
2. Minimum Thickness: 1/4 inch (6.35 mm).
3. Slope:

a. Roof Field: 1/4 inch per foot (1:48) unless otherwise indicated on Drawings.
b. Saddles and Crickets: 1/2 inch per foot (1:24) unless otherwise indicated on Drawings.

2.6 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer; select from the following as required to meet indicated performance requirements:

1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
2. Full-spread, spray-applied, low-rise, two-component urethane adhesive.

**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 wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Existing Roof Decks: Refer to Section 07 0150.19 “Preparation for Reroofing”.

D. Perform fastener-pullout tests according to roof system manufacturer's written instructions.

1. Submit test result within 24 hours of performing tests.

a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

## 3.3 INSTALLATION OF ROOFING, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, SPRI's Directory of Roof Assemblies assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

## 3.4 INSTALLATION OF INSULATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Decking, General Requirements:

1. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. Make joints between adjacent insulation boards not more than 1/4 inch in width.
3. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.

a. Trim insulation so that water flow is unrestricted, but insulation thickness at drain perimeter shall not be less than 2 inches.

4. Fill gaps exceeding 1/4 inch with insulation.
5. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
6. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
7. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation. Stagger end joints within each layer not less than 24 inches in adjacent rows.

D. Adhered Insulation: Install each layer of insulation and adhere to substrate; select from the following as required to meet indicated performance requirements:

1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
2. Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

E. Mechanically-Fastened Insulation: Mechanically attach first layer of insulation and tapered insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to wood decks. Subsequent layers of insulation shall be adhered.

1. Fasten insulation according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
2. Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
3. Dip threads of fasteners in roofing sealant prior to installation.

3.5 INSTALLATION OF ADHERED ROOF MEMBRANE

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll membrane roof membrane and allow to relax before installing.

C. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

E. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeters.

1. Do not mechanically fasten through roof deck.

F. Apply roof membrane with side laps shingled with slope of roof deck where possible.

G. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

3.6 INSTALLATION OF BASE FLASHING

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to 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 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.

3.7 FIELD QUALITY CONTROL

A. Manufacturer’s Field Inspections: Roofing system manufacturer's technical personnel shall be present on site not less than the following:

1. Deck Inspection and Beginning of System Installation.
2. Beginning of Roof Membrane Installation.
3. Final Roof Inspection: Inspect roofing installation upon completion in presence of Architect.

B. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

1. Submit reports for each inspection, describing problems observed and corrections made.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.8 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**END OF SECTION**

## SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Custom flashing and trim fabrications, made from the following:

1. Sheet metal materials.
2. Underlayment.
3. Miscellaneous materials.

B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 04 2000 "Unit Masonry" for installation of manufactured sheet metal through-wall flashing and trim integral with masonry.
3. Section 07 5323 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing" for installation of sheet metal flashing and trim integral with roofing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review sheet metal flashing observation and repair procedures after flashing installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For sheet metal flashing and trim.

1. Plans, elevations, sections, and attachment details.
2. Fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Identification of material, thickness, weight, and finish for each item and location in Project.
4. Details for forming, including profiles, shapes, seams, and dimensions.
5. Details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Details of termination points and assemblies.
7. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Details of roof-penetration flashing.
9. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
10. Details of special conditions.
11. Details of connections to adjoining work.
12. Formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples: For each exposed product and for each color and texture specified, 12 inches (300 mm) long by actual width.

D. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

E. Samples for Verification: Actual sample of finished products for each type of exposed finish for sheet metal and other metal accessories.

1. Sheet Metal Flashing and Trim: Manufacturers' standard size. Include finished seam with required profile. Include fasteners, cleats, clips, closures, and other attachments.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

B. Qualification Statements: For fabricator.

C. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Entity that 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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 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. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to 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 are not to rattle, leak, or loosen, and are to remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

### 2.2 SHEET METAL MATERIALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with minimum ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: As selected by Architect from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Aluminum Sheet: Coil-coated sheet, ASTM B209/B209M, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Color: As selected by Architect from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil (0.013 mm).

D. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
1. Finish: 2D (dull, cold rolled).

## 2.3 UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D1970/D1970M.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (minus 29 deg C) or lower; ASTM D1970/D1970M.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum, of type required for application.

## 2.4 MISCELLANEOUS MATERIALS

A. 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 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.

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 Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.

3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
4. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Solder: Types recommended by metal manufacturers for indicated applications.

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 (13 mm) wide and 1/8 inch (3 mm) thick.

E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or 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 C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

I. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

## 2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
   3. 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.
   4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

   1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 ft. (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

   2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
   3. Use lapped expansion joints only where indicated on Drawings.

C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

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 and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

F. Seams:
   1. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
   2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.
   3. Stainless Steel Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

G. Do not use graphite pencils to mark metal surfaces.

## 2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters:

   1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
   2. Fabricate in minimum 96-inch- (2400-mm-) long sections.
   3. Furnish flat-stock gutter brackets and flat-stock 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.
   4. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
   5. Gutter Profile: As indicated on drawings..
   6. Expansion Joints: Butt type with cover plate.

7. Accessories: Valley baffles.
8. Gutters with Girth up to 15 Inches (380 mm): Fabricate from the following materials:

    a. Galvanized Steel: 0.022 inch (0.56 mm) thick.
    b. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
    c. Aluminum: 0.032 inch (0.81 mm) thick.

9. Gutters with Girth 16 to 20 Inches (410 to 510 mm): Fabricate from the following materials:

    a. Galvanized Steel: 0.028 inch (0.71 mm) thick.
    b. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.
    c. Aluminum: 0.040 inch (1.02 mm) thick.

B. Downspouts: Fabricate downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.

1. Fabricated Hanger Style: According to SMACNA's "Architectural Sheet Metal Manual."
2. Fabricate from the following materials:

    a. Galvanized Steel: 0.022 inch (0.56 mm) thick.
    b. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
    c. Aluminum: 0.024 inch (0.61 mm) thick.

## 2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Cap: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 12 ft. (3.6 m) long sections. Furnish with 6-inch- (150-mm-) wide, joint cover plates. Shop fabricate interior and exterior corners.

1. Joint Style: Butted with expansion space and 6-inch- (150-mm-) wide, concealed backup plate.
2. Fabricate from the following materials:

    a. Galvanized Steel: 0.028 inch (0.71 mm) thick.
    b. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.
    c. Aluminum: 0.050 inch (1.27 mm) thick.

B. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch (0.71 mm) thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch (0.71 mm) thick.
3. Aluminum: 0.040 inch (1.02 mm) thick.
4. Stainless Steel: 0.019 inch thick.

C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
3. Aluminum: 0.032 inch (0.81 mm) thick.
4. Stainless Steel: 0.0188 inch (0.477 mm) thick.

D. Flashing Receivers: Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
3. Aluminum: 0.032 inch (0.81 mm) thick.
4. Stainless Steel: 0.0156 inch (0.396 mm) thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm-) long, but not exceeding 12 ft. (3.6 m) long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings; and form with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.0156 inch (0.396 mm) thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high, end dams. Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch (0.56 mm) thick.
2. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch (0.56 mm) thick.
3. Aluminum: 0.032 inch (0.81 mm) thick.
4. Stainless Steel: 0.0156 inch (0.396 mm) thick.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrates, and other conditions affecting performance of the Work.
1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment:

1. Install self-adhering, high-temperature sheet underlayment; wrinkle free.
2. Prime substrate if recommended by underlayment manufacturer.
3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures.
4. Apply in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses.
5. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps and edges with roller.
6. Roll laps and edges with roller.
7. Cover underlayment within 14 days.

B. Install slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

1. Install in shingle fashion to shed water.
2. Lapp joints not less than 4 inches (100 mm).

3.3 INSTALLATION OF SHEET METAL FLASHING AND TRIM, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
5. Space individual cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
6. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
7. Do not field cut sheet metal flashing and trim by torch.
8. Do not use graphite pencils to mark metal surfaces.

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.

1. Space movement joints at maximum of 10 ft. (3 m) with no joints within 24 inches (600 mm) of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
3. 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.

1. Use sealant-filled joints unless otherwise indicated.

a. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant.
b. Form joints to completely conceal sealant.
c. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way.
d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

2. Prepare joints and apply sealants to comply with requirements in Section 07 9200 "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pretin edges of sheets with solder to width of 1-1/2 inches (38 mm); however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder aluminum sheet.
3. Do not use torches for soldering.
4. Heat surfaces to receive solder, and flow solder into joint.

a. Fill joint completely.

b. Completely remove flux and spatter from exposed surfaces.

5. Stainless Steel Soldering:

a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
b. Promptly remove acid-flux residue from metal after tinning and soldering.
c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

## 3.4 INSTALLATION OF ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Hanging Gutters:

1. Join sections with joints sealed with sealant.
2. Provide for thermal expansion.
3. Attach gutters at eave or fascia to firmly anchor them in position.
4. Provide end closures and seal watertight with sealant.
5. Slope to downspouts.
6. Fasten gutter spacers to front and back of gutter.
7. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches (600 mm) apart.
8. Anchor gutter with straps spaced not more than 24 inches (600 mm) apart to roof deck unless otherwise indicated, and loosely lock to front gutter bead.
9. Install gutter with expansion joints at locations indicated on Drawings, but not exceeding, 50 ft. (15.2 m) apart. Install expansion-joint caps.

C. Downspouts:
1. Provide hangers with fasteners designed to hold downspouts securely to walls.
2. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.
3. Connect downspouts to underground drainage system.

## 3.5 INSTALLATION OF SLOPED ROOF SHEET METAL FABRICATIONS

A. Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard.

1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch (75-mm) centers.
3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4 inches (100 mm) over base flashing.
3. Lap counterflashing joints minimum of 4 inches (100 mm).

4. Secure in waterproof manner by means of anchor and washer spaced at 12 inches (300 mm) o.c. along perimeter and 6 inches (150 mm) o.c. at corners areas unless otherwise indicated.

3.6 INSTALLATION OF WALL SHEET METAL FABRICATIONS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

3.7 INSTALLATION TOLERANCES

A. Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 ft. (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING

A. Clean and neutralize flux materials. Clean off excess solder.

B. Clean off excess sealants.

3.9 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

**END OF SECTION**

## SECTION 07 9200 - JOINT SEALANTS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Butyl joint sealants.
6. Latex joint sealants.
7. Semi-rigid joint sealants.

B. Related Requirements:
1. Section 07 9219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.
2. Section 08 8000 “Glazing” for sealants used in glazing installation.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Joint-sealants.
2. Joint sealant backing materials.

B. Samples for Initial Selection: Manufacturer's standard 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 type and color of exterior 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.

1.4 INFORMATIONAL SUBMITTALS

A. 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.

B. Preconstruction Laboratory Test Reports: For each joint sealant and substrate material to be tested 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.

C. 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.

D. Field Quality-Control Reports: For field-adhesion-test reports, for each sealant application tested.

E. Sample warranties.

## 1.5 CLOSEOUT SUBMITTALS

A. Manufacturers' special warranties.

B. Installer's special warranties.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified in accordance with ASTM C1021 to conduct the testing indicated.

## 1.7 MOCKUPS

A. 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.

## 1.8 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. Scope:

      a. Exterior sealants.
      b. Interior sealants used at the interior of exterior walls and fenestration.
      c. Interior sealants in contact with masonry.
   2. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   3. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
   4. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with stone and masonry substrates.
   5. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
   6. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   7. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.

8. 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.
5. Test Method: Test joint sealants in accordance with Method A, Tail Procedure, in ASTM C1521.

   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.
6. 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.
7. 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.

## 1.9 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 or greater 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.

## 1.10 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. Silicone Sealants: Twenty years from date of Substantial Completion.
2. All Other Sealants: Five 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. Schedule: Refer to Joint Sealant Schedule at the end of this Section.

B. 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.

C. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600 or NSF/ANSI 51.

D. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
   1. Architectural sealants shall have a VOC content of 250 g/L or less.
   2. Sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
   3. Sealant primers for porous substrates shall have a VOC content of 775 g/L or less.

### 2.2 SILICONE JOINT SEALANTS

A. **JS1 -** Silicone, S, P, 100/50, T: Single-component, pourable, plus 100 percent and minus 50 percent movement capability, traffic-use, neutral-curing silicone joint sealant: ASTM C920, Type S, Grade P, Class 100/50, for Use T.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Dow Chemical Company; DOWSIL 890-SL.
      b. Pecora Corporation; 300 SL.
      c. Tremco Incorporated; Spectrem 900 SL.

B. **JS14** - 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 C920, Type S, Grade NS, Class 100/50, Use NT. Approved by manufacturer for use in chlorine-pool environments.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Tremco Incorporated; Spectrem 1.
      b. Products acceptable to glazing, glazing accessory, and fenestration manufacturers.

### 2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. **JS2 -** 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 C920, Type S, Grade NS, Class 50, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Chemical Company; DOWSIL 756 SMS.
      b. GE Construction Sealants; Momentive Performance Materials, Inc.; SCS9000 SilPruf NB.
      c. Pecora Corporation; 864NST or 895NST.
      d. Tremco Incorporated; Spectrem 2.

2.4 URETHANE JOINT SEALANTS

A. **JS5 -** 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 C920, Type S, Grade P, Class 25, Uses T and NT.
   1. Products: Subject to compliance with requirements, provide one of the following:

      a. Master Builders Solutions; MasterSeal SL 1.
      b. Pecora Corporation; NR-201.
      c. Polymeric Systems, Inc.; Flexiprene PSI-952.
      d. Sherwin-Williams Company (The); Loxon SL1.
      e. Tremco Incorporated; Vulkem 45 SSL.

B. **JS6 -** Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:

      a. Master Builders Solutions; MasterSeal NP 1.
      b. Pecora Corporation; Dynatrol I-XL.
      c. Sherwin-Williams Company (The); Loxon S1.
      d. Tremco Incorporated; Dymonic FC.

2.5 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. **JS8 -** 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 C920, Type S, Grade NS, Class 25, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:

      a. Dow Chemical Company; DOWSIL 786 Mildew Resistant.
      b. GE Construction Sealants; Momentive Performance Materials, Inc.; Sanitary SCS1700.
      c. Pecora Corporation; 898NST.
      d. Sika Corporation; Sikasil GP.
      e. Tremco Incorporated; Tremsil 200.

C. **JS13 -** 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 C920, Type S, Grade NS, Class 25, Use NT. Approved for food contact; compliant with 21 CFR 177.2600 or NSF/ANSI 51.
   1. Products: Subject to compliance with requirements, provide one of the following:

      a. Dow Chemical Company; DOWSIL 786 Mildew Resistant.
      b. Sika Corporation; Sikasil GP.

2.6 BUTYL JOINT SEALANTS

A. **JS9 -** Butyl-Rubber-Based Joint Sealants: ASTM C1311.
   1. Products: Subject to compliance with requirements, provide one of the following:

      a. DAP Products, Inc..; Butyl-Flex.
      b. Pecora Corporation; BC-158.
      c. Tremco Incorporated; Tremco Butyl Sealant.

2.7 LATEX JOINT SEALANTS

A. **JS7 -** Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, paintable, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, provide one of the following:

a. DAP Products, Inc..; ALEX Plus.
b. Master Builders Solutions; MasterSeal NP 520.
c. Pecora Corporation; AC-20 +Silicone.
d. Sherwin-Williams Company (The); 950A or PowerHouse.
e. Tremco Incorporated; Tremflex 834.

2.8 SEMI-RIGID JOINT SEALANTS

A. **JS11** - Multi-Component Polyurea Sealant: Manufacturer's standard, multi-component, chemical curing.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Euclid Chemical; Euco QWIKJoint UVR.
b. General Polymers; 4880.
c. Master Builders Solutions; MasterSeal CR 100.
d. Metzger-McGuire; Spal-Pro RS 88
2. Shore Hardness (ASTM D2240, Shore A): 80 minimum.
3. Uses Related to Exposure: T (Traffic).

B. **JS12** - Multi-Component Epoxy Sealant: Manufacturer's standard, multi-component, self-leveling, chemical curing.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Euclid Chemical; Euco 700.
b. Master Builders Solutions; MasterSeal CR 190.
c. Metzger-McGuire; MM-80.
2. Shore Hardness (ASTM D2240, Shore A): 80 minimum.
3. Uses Related to Exposure: T (Traffic).

2.9 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.

B. Cylindrical Sealant Backings: ASTM C1330, of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
1. Individual rod width must be of adequate width to fit snugly in joint. Combining, twisting or braiding of smaller rods is not acceptable for wider joints.
2. Select from the following:

a. Type C: Closed-cell material with a surface skin; non-gassing.
b. Type B: Bicellular material with a surface skin (“soft rod”).

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.

2.10 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.
   1. Concrete Slabs: Verify that minimum concrete drying period recommended by joint sealant manufacturer has passed.

      a. Semi-Rigid Joint Fillers: Concrete shall cure not less than 90 days.

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.
   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.

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 C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type 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 in accordance with 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 in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
   4. Provide flush joint profile at locations indicated on Drawings in accordance with Figure 8B in ASTM C1193.
   5. Provide recessed joint configuration at the following locations according to Figure 8C in ASTM C1193; use masking tape to protect surfaces adjacent to recessed tooled joints.

      a. At locations indicated on Drawings. Recess depth shall be as indicated on Drawings.
      b. At sealant filled joints in masonry indicated to have raked joints. Recess depth shall be as indicated for raked masonry joints.

## 3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency or an experienced manufacturer’s field representative to perform tests and inspections.

B. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Scope:

      a. Exterior sealants.
      b. Interior sealants used at the interior of exterior walls and fenestration.
   2. Extent of Testing: Test completed and cured sealant joints as follows:

      a. Perform 10 tests for the first 1000 ft. of joint length for each kind of sealant and joint substrate.

b. Perform one test for each 1000 ft. of joint length thereafter or one test per each floor per elevation.
c. Failed Tests: Perform one additional test for each failed test.

3. Test Method: Test joint sealants in accordance with Method A, Tail Procedure, in ASTM C1521.

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.

4. 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.

5. 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.
6. 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.
7. 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.

C. Joint sealants will be considered defective if they do not pass tests and inspections.
1. Submit reports for each inspection, describing problems observed and corrections made.

D. Additional testing and inspecting, at Contractor's expense, shall be performed to determine if replaced or additional work complies with specified 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 - JS1: Exterior joints in horizontal traffic surfaces.
1. Joint Locations:

a. Isolation and contraction joints in cast-in-place concrete slabs.
b. Other joints as indicated on Drawings.

2. Joint Sealant: Silicone, S, P, 100/50, T, neutral curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application- JS2: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Construction joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints in stone and unit masonry veneer cladding.
    d. Joints between metal panels.
    e. Joints between different materials listed above.
    f. Perimeter joints between materials listed above and frames of fenestration.
    g. Control and expansion joints in soffits and other overhead surfaces.
    h. 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.

C. Joint-Sealant Application – JS5: Interior joints in horizontal traffic surfaces.
1. Joint Locations:

    a. Control and expansion joints in tile flooring.
    b. 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.

D. Joint-Sealant Application – JS11 or JS12: Interior joints in horizontal traffic surfaces.
1. Joint Locations:

    a. Isolation and control joints in cast-in-place concrete slabs.
    b. Isolation and control joints in polished concrete floors.
    c. Other joints as indicated on Drawings.
2. Joint Sealant: Semi-rigid, T.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application – JS6: 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 and concrete walls and partitions.
    d. Perimeter joints of frames of doors and fenestration on interior surfaces of exterior walls.
    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 – JS7: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
1. Joint Locations:

    a. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    b. Joints between typical countertops, splashes, and cabinets and adjoining walls.
    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 – JS8: 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 within 10 feet of a plumbing fixture.
    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 – JS13: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces in food preparation areas.
   1. Joint Locations:

      a. Joints between food preparation/service surfaces, splashes, and equipment and adjoining walls, floors, and counters.
      b. Other joints as indicated on Drawings.
   2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
   3. Joint-Sealant Color: Clear.

I. Joint-Sealant Application – JS9: 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. Exposed Joint-Sealant Color: Manufacturer's standard.

**END OF SECTION**

## SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Interior steel doors and frames.
2. Exterior steel doors and frames.

B. Related Requirements:
1. Section 08 7100 "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 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.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Agenda items shall include door clearances and gaps.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, 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 anchorages, joints, field splices, and connections.
7. Details of accessories.
8. 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 thermally rated door assemblies for tests performed by a qualified testing agency indicating compliance with performance requirements.

B. Field quality control reports.

1.7 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

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.

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- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) 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. Mesker Door Inc.
4. Republic Doors and Frames; an Allegion brand.
5. Steelcraft; an Allegion brand.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.36 deg Btu/F x h x sq. ft. (2.27 W/K x sq. m) when tested in accordance with ASTM C1363 or ASTM E1423.

2.3 INTERIOR 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 on Drawings.
b. Thickness: 1-3/4 inches (44.5 mm).
c. Face: Uncoated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
d. Edge Construction: Model 2, Seamless.
e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
f. Core: Manufacturer's standard.

2. Frames:

a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm).
b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
c. Construction: Full profile welded.

3. Exposed Finish: Prime.

## 2.4 EXTERIOR 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. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A.

1. Doors:

a. Type: As indicated in the Door and Frame Schedule on Drawings.
b. Thickness: 1-3/4 inches (44.5 mm).
c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A60 (ZF180) coating.
d. Edge Construction: Model 2, Seamless.
e. Edge Bevel: Bevel lock and hinge edges 1/8 inch in 2 inches (3.2 mm in 51 mm).
f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
g. Bottom Edges: Close bottom edges of doors with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
h. Core: Polyurethane.

2. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A60 (ZF180) coating.
b. Construction: Full profile welded.

3. Exposed Finish: Prime.

## 2.5 BORROWED LITES

A. Fabricate of uncoated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
1. Construction: Full profile welded.
2. Exposed Finish: Prime.

B. 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.

C. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

## 2.6 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 (610 mm) of frame height above 7 feet (2.1 m).
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Floor Anchors: Provide floor anchors with concealed fasteners for each jamb and mullion that extends to floor.

C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) 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.

## 2.7 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, with minimum A60 (ZF180) coating.

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 Wool Insulation: ASTM C612, water repellent, synthetic vitreous fiber, semi-rigid, board insulation manufactured from predominantly basalt rock and physically forming it into fibers; 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 8000 "Glazing."

## 2.8 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 (19 mm) 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 and Transom Bar 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. Frame Profiles: Manufacturer's standard profiles except where non-standard profiles are indicated on Drawings and as follows:

   a. Gypsum Board Assemblies: Provide backbends on frame throat at all frames installed in gypsum board assemblies.

4. 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 on Drawings, 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 butted or mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with beveled 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 doors and frames 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 (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

E. Label Locations: Labels required for fire-rated and smoke- and draft-control door and frames shall be installed on the head rabbet of the frame and the top edge of the door at doors scheduled to receive continuous hinges.

## 2.9 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 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 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.

### 3.3 INSTALLATION

A. General: 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.

1. Check plumb, square, and twist of frames as walls are constructed.

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. 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.

3. Solidly pack mineral wool insulation inside frames.
4. 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.
5. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch (1.6 mm), 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.

D. Glazing: Comply with installation requirements in Section 08 8000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.4 CLEANING AND TOUCHUP

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. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint in accordance with manufacturer's written instructions.

**END OF SECTION**

## SECTION 08 1416 - FLUSH WOOD DOORS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core five-ply flush wood veneer-faced doors for transparent finish.
2. Solid-core five-ply flush wood doors for opaque finish.
3. Factory priming and finishing flush wood doors.
4. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:
1. Section 08 1113 “Hollow Metal Doors and Frames” for frames for wood doors.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Agenda items shall include required door clearances and gaps.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core materials and construction.
2. Door edge construction
3. Door face type and characteristics.
4. Door trim for openings.
5. Factory-machining criteria.
6. Factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door location, type, size, fire protection rating, and swing.
2. Door elevations, dimension and locations of hardware, lite cutouts, and glazing thicknesses.
3. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
4. Dimensions and locations of blocking for hardware attachment.
5. Dimensions and locations of mortises and holes for hardware.
6. Clearances and undercuts.
7. Requirements for veneer matching. Indicate doors requiring pair/set match or room match.
8. Doors to be factory finished and application requirements.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Corner sections of doors, approximately 8 by 10 inches (200 by 250 mm), with door faces and edges representing actual materials to be used.

a. Provide Samples for each species of veneer and solid lumber required.
b. Finish veneer-faced door Samples with same materials proposed for factory-finished doors. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

1.4 CLOSEOUT SUBMITTALS

A. Special warranties.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags and protected corners or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings; omit marking on top rail of door if top of door is finished.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of veneer.
b. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Masonite Architectural.
2. Oshkosh Door Company.
3. VT Industries, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI Standards current edition (AWI).

1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

B. Door Thickness: 1-3/4 inches unless otherwise indicated.

2.3 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Doors, Solid-Core Five-Ply Veneer-Faced:

1. AWI Grade: Premium, with Grade A faces.
2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty.
3. Faces: Single-ply wood veneer not less than 1/50 inch (0.508 mm) thick.

a. Species: Refer to Room Finish Material Key on Drawings.
b. Cut: Refer to Room Finish Material Key on Drawings.
c. Match between Veneer Leaves: Refer to Room Finish Material Key on Drawings.
d. Assembly of Veneer Leaves on Door Faces Refer to Room Finish Material Key on Drawings.
e. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.

4. Exposed Vertical Edges: Applied wood-veneer edges of same species as faces and covering edges of faces - Architectural Woodwork Standards edge Type B.

5. Core for Non-Fire-Rated Doors: ANSI A208.1, Grade LD-2 particleboard.

a. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
b. Provide doors with WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 08 7100 "Door Hardware."

6. Construction: Five plies, bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated.

1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
2. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied.

1. Locate hardware to comply with DHI-WDHS-3.
2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.

3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.

2.5 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing.

1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
2. Finish faces, all four edges, edges of cutouts, and mortises.
3. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. AWI Grade: Premium.
2. Finish: One of the following:

a. AWI System-8, UV Curable, Acrylated Epoxy, Polyester or Urethane.
b. ANSI/WDMA I.S. 1A TR-8 UV Cured Acrylated Polyester/Urethane.

3. Staining: Refer to Room Finish Material Key on Drawings.
4. Effect: Refer to Room Finish Material Key on Drawings.
5. Sheen: Refer to Room Finish Material Key on Drawings.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 08 7100 "Door Hardware."

B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

**END OF SECTION**

## SECTION 08 1613 - FIBERGLASS REINFORCED PLASTIC (FRP) DOORS AND FRAMES

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial Grade, Fiberglass Reinforced Plastic (FRP) doors and frames.

B. Related Requirements:

1. Section 08 7100 "Door Hardware" for door hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, and finishes.

B. Shop Drawings: Show the following:

1. Elevations of each door and frame type.
2. Details of doors and frames including vertical and horizontal edge details.
3. Frame details for each frame type, including dimensioned profiles.
4. Details and locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorage, accessories, joints, and connections.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors available.

D. Samples for Verification:

1. For each type of exposed finish required, prepare a sample not less than 3 by 5 inches and of same thickness and material indicated for final unit of Work.
2. Doors: Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
3. Frames: Show profile, corner joint, and floor and wall anchors.

E. Door Schedule: Use same reference designations indicated on Drawings in preparing schedule for doors and frames.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of door and frame assembly, for tests performed by a qualified testing agency.

B. Field quality control reports.

1.4 QUALITY ASSURANCE

A. Manufacturer's Field Service: Manufacturer's representative shall be available upon request to provide technical assistance and guidance for installation of doors and frames.

B. Installer Qualifications: An installer acceptable to FRP door manufacturer for installation of units required for this Project.

C. Product Options: Information on Drawings and in Specifications establishes requirements for FRP doors' aesthetic effects and performance characteristics. 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. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard wrapped or crated to provide protection during transit and job storage and to prevent damage to finish.

B. Inspect doors and frames upon delivery for damage. Remove and replace damaged items as directed.

C. Store doors and frames vertically at building site under cover. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4 inch spacers between doors to promote air circulation.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace FRP doors and frames that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Failure to meet performance requirements.
2. Faulty operation of entrances.
3. Deterioration of finishes, and other materials beyond normal weathering.
4. Warranty Period:

a. General: Ten years from date of Substantial Completion.
b. Corrosion: Lifetime.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide indicated products or comparable product by one of the following:

1. Chem-Pruf Door Co., Ltd.
2. Corrim Co.
3. Special-Lite, Inc.
4. Tiger Door

B. Source Limitations: Obtain doors and frames through one source from a single manufacturer.

## 2.2 PERFORMANCE REQUIREMENTS

A. Cycle Slam Testing: Per ANSI A250.4 door shall have been cycled a minimum of 1,000,000 swings without failure of door.

B. Screw Pullout Testing: Frames and stiles and rails of doors shall resist a minimum 900 pounds of withdrawal force to each applied #11 or #12 hinge screw.

C. Surface-Burning Characteristics of FRP Components: Comply with ASTM E 84, Class A; 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.

## 2.3 DOORS

A. Door Types:

1. Interior, Non-Rated Doors: Basis-of-Design Product: Chem-Pruf, "Model CP1".

B. Provide 1-3/4 inch thick fiberglass reinforced plastic doors with cores of types shown on Door Schedule. No wood products shall be included in door construction.

1. Construction: Seamless. Pultruded door slab or an assembly of pultruded components assembled by chemical welding.
2. Color: As selected by Architect from manufacturer's full range.
3. Texture: Smooth, matte.

C. Door Face Sheets: Fiberglass reinforced plastic (FRP) sheets, manufactured with corrosion resistant resin system and light stabilizing additives.

1. Minimum Door Panel Thickness: 0.110-inch.
2. Standard Plate: Reinforce resin with minimum two (2) layers random glass fiber mats and one layer of roving, saturated with resins, but not less than a ratio of 30/70 glass to resin.

   a. Fiberglass Mat: Random glass fiber mat, minimum 1.5 ounces per square foot of glass material.
   b. Roving: Unidirectional glass fiber mat, minimum 16 ounces per square yard weight.

D. Stiles and Rails: Manufacturer's standard stile and rail door edge system of FRP.

E. Door Cores: Cores shall be completely filled and without voids.

1. Interior Non-Rated Door Assembly: Manufacturer's standard core.

F. Reinforcement: Metal or Polyester-based resin, filled with 1/8-inch chopped glass strands, shall be used for reinforcements and corner blocks.

## 2.4 FRAMES

A. Basis-of-Design Product: Chem-Pruf, "Style 4"; 1.76 inches by 5.75 inches nominal profile.

B. Frames shall be pultruded fiberglass with integral concealed frame and hardware reinforcing.

C. Head and jamb members shall be standard 45-degree miter, providing a neatly mitered corner seamless connection. Frame units shall be one-piece, factory-assembled.

1. Metal reinforcements, exposed fasteners, and knock-down frames shall not be acceptable.

D. Mullions: Removable center mullions between pairs of doors.

E. Profiles: Equal rabbet frame with 2-inch nominal faces, unless otherwise indicated. One-piece construction.

F. Color and Texture: Match doors.

G. Anchors: Furnish at least three anchors in each jamb of frames up to 90 inches high and one additional anchor for each 30 inches in height above 90 inches. Anchor types shall be appropriate for adjoining wall construction.

2.5 ACCESSORIES

A. Fasteners: Type 316 Stainless steel.

2.6 FABRICATION

A. Fabricate doors and frames to be rigid, neat in appearance and free from defects, warp or buckle. Fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site.

B. Clearances: Refer to clearances indicated in Part 3 of this Section.

C. Vertical Edges for Single-Acting Doors: Bevel lock stile edges 1/8 inch in 2 inches (3.2 mm in 51 mm). Square lock stile edges shall not be acceptable.

D. Fabricate exposed faces of doors, reinforcement, and moldings from fiberglass reinforced plastic.

E. Fabricate exposed edge channels from fiberglass reinforced plastic or extruded aluminum.

F. Seamless Construction: All six sides of door shall be seamless.

G. Openings: Openings in door faces shall be completely sealed so that door cores are not exposed to the environment.

H. Hardware Preparation: Prepare doors to receive mortised and concealed hardware in accordance with final Door Hardware Schedule and templates provided by hardware supplier.

1. Reinforce doors to receive surface applied hardware. Drilling and tapping for surface applied hardware may be done at project site in strict accordance with manufacturer's recommendations.

a. Through-bolting of hardware shall not be allowed.

2. Locate hardware as indicated on final shop drawings or, if not indicated, according to HMMA 831, "Recommended Hardware Locations for Hollow Metal Doors and Frames".

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Do not proceed with installation work until unsatisfactory conditions have been corrected in an acceptable manner.

3.2 INSTALLATION

A. General: Install doors, frames and accessories in accordance with final shop drawings, manufacturer's printed installation instructions, using materials and methods specified in installation instructions. Doors and frames shall be plumb, rigid, properly aligned, and securely fastened in place.

B. Install door opening assemblies in accordance with ANSI/SDI A250.8 and manufacturer's instructions.

1. Field alteration of doors and frames is prohibited.

C. Coordinate installation of doors and frames with installation of hardware.

D. Fit doors accurately in frames with the following clearances:

1. Non-Fire-Rated Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

D. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in NFPA 80.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items leaving doors undamaged and in complete and proper operating condition. Adjust doors to swing open and shut without binding, and to remain in any position without being moved by gravitational influence.

B. Remove dirt, excess sealant, and protective material from exposed surfaces. Follow manufacturer’s recommendations for cleaning techniques, cleaning materials and procedures that shall not scratch or otherwise damage the finished surfaces.

C. Touch up finishes as recommended by manufacturer.

**END OF SECTION**

## SECTION 08 3113 - ACCESS DOORS AND FRAMES

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Access doors and frames for walls and ceilings.

1.2 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. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.

C. Product Schedule: For access doors and frames. Provide complete schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation Materials: Keys.

B. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

### PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Acudor Products Inc.
2. Babcock-Davis.
3. Cendrex, Inc.
4. J. L. Industries, Inc.; a division of Activar Construction Products Group.
5. Karp Associates, Inc.
6. Larsen's Manufacturing Company.
7. Milcor; a division of Hart & Cooley, Inc.
8. Nystrom, Inc.
9. Williams Bros. Corporation of America (The).

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

2.2 SCOPE

A. Provide access doors where indicated and where required for access to concealed equipment and controls. Determine and coordinate specific locations and sizes for access doors, and indicate these in schedule specified in “Submittals” Article of this Section.

1. Suspended acoustical panel ceilings shall be considered adequate for equipment access unless otherwise indicated.
2. Coordination: Where practicable, group concealed item locations in such a manner to reduce the quantity of access doors as much as possible.

2.3 ACCESS DOORS AND FRAMES

A. General:

1. Door Size: As indicated on Drawings; if size is not indicated minimum size is 18 by 24 inches.

a. Panel size may be reduced below the minimum size indicated above only if the item to be accessed through the panel is no further from the panel opening than the smallest dimension of the panel. In this case, the minimum size of panel is 12 by 12 inches.

2. Interior Release Mechanism: Doors 16 by 16 inches or larger shall include interior release.
3. Schedule: Refer to schedule at the end of this Section.

B. Flush Access Doors with Exposed Flanges – **Types AD 01 and AD 03**:

1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
2. Locations: Wall and ceiling.
3. Door Material:

a. Type AD 01: Uncoated Steel Sheet: Nominal 0.060 inch, 16 gage, factory primed.
b. Type AD 03: Metallic-Coated Steel Sheet: Nominal 0.064 inch, 16 gage, factory primed.

4. Frame Material: Same material, thickness, and finish as door.
5. Door Gaskets: Manufacturer’s standard.
6. Hinges: Concealed pivoting rod hinge.
7. Latch and Lock: Cam latch, key operated.

2.4 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879/A879M, with cold-rolled steel sheet substrate complying with ASTM A1008/A1008M, Commercial Steel (CS), exposed.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

D. Frame Anchors: Same material as door face.

E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.5 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.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. 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.

D. 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.

3.3 FIELD QUALITY CONTROL

A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

C. Prepare and submit separate inspection report for each fire-rated access door indicating compliance with each item listed in NFPA 80.

3.4 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

3.5 SCHEDULE

A. Typical:

1. Non-Rated Construction: AD 01

B. Wet Areas: Spaces located below grade and rooms containing a plumbing fixture where access door is within 10 feet of fixture.

1. Non-rated Construction, Wet Areas: AD 03

**END OF SECTION**

## SECTION 08 4113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed entrance and storefront systems.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Attendees:

a. Owner's Representative.
b. Architect.
c. Installer.

2. Review storefront requirements and installation, opening preparation, forecasted weather conditions, special details, mockups, testing and inspection procedures, and protection and repairs.
3. Review submittals.

1.3 ACTION SUBMITTALS

A. Product Data: For each product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings:

1. Plans, elevations, sections, full-size details, and attachments to other work.
2. Details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
3. Full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrance and storefront systems, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

C. Samples for Verification: Actual sample of finished products for each type of exposed finish, not less than 3 inches by 4 inches.

1. Anodized Finishes: Provide set of three Samples showing typical range of color variation to be expected in finished Work.

D. Delegated-Design Submittals: For aluminum-framed entrances and storefront systems including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For aluminum-framed entrance and storefront systems, for tests performed by a qualified testing agency.

1. Maximum Water Penetration: Water penetration test results shall document compliance with “maximum water penetration” as defined in the Performance Requirements of this Section, or compliance shall be certified by the manufacturer.

C. Field quality-control reports.

D. Sample Warranties.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer with a minimum of 10 years’ successful experience in the design and fabrication of the products of this Section.

1. Technical Representation: Manufacturer’s technical representatives, directly employed by the manufacturer, shall be available on-site upon request.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Experience: Installer shall have a minimum of 5 years’ successful experience with work of this Section on projects of similar scope and complexity.

C. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.

D. Testing Agency Qualifications: Qualified in accordance with ASTM E699 for testing indicated and acceptable to Owner and Architect.

E. 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.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrance and storefront systems 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 and other materials beyond normal weathering and use.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, peeling, or chipping.

2. Warranty Period: Five years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide indicated product or comparable product by one of the following:

1. EFCO Corporation.
2. Kawneer North America; an Arconic company.
3. Oldcastle BuildingEnvelope.
4. YKK AP America, Inc.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design aluminum-framed entrance and storefront systems.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrance and storefront systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrance and storefront systems to 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.

    a. Interior units shall be designed for uniformly distributed load of not less than 5 lb/sq. ft..

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 (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m).
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 (3.2 mm).

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 6.24 lbf/sq. ft. (300 Pa).
2. Maximum Water Penetration: No water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation.

G. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:
1. Thermal Transmittance (U-factor): System U-factor of not more than the following as determined in accordance with NFRC 100:
    a. Fixed Glazing and Framing Areas: 0.36
2. 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.

H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.3 ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Product:

    a. Basis-of-Design Product: Kawneer, “Trifab VersaGlaze 601T Series”.
    b. Construction: Thermally broken.
    c. Glazing Plane: Center.
    d. Framing Profile: 2 inch x 6 inch nominal.

2. Interior Product:

a. Basis-of-Design Product: Kawneer, “Trifab VersaGlaze 451T Series”.
b. Construction: Thermally broken.
c. Glazing Plane: Center.
d. Framing Profile: 1 3/4 inch x 4 1/2 inch nominal.

3. Glazing System: Retained mechanically with gaskets on two and four sides.
4. Glazing Plane: Center.
5. Finish: Color anodic finish.

a. Color: Dark bronze.

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.

B. Backer Plates: Manufacturer's standard, continuous thermally-broken backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Subsill: Manufacturer's extruded-aluminum thermally-broken subsill for exterior storefront.

## 2.4 GLAZING

A. Glazing: Comply with Section 08 8000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers. Comply with Section 08 8000 "Glazing."

C. Glazing Sealants: As recommended by manufacturer. Comply with Section 08 8000 "Glazing."

## 2.5 MATERIALS

A. Sheet and Plate: ASTM B209 (ASTM B209M).

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221 (ASTM B221M).

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.

## 2.6 ACCESSORIES

A. Sheet Metal Flashing and Trim: Provide flashing and trim as indicated on Drawings and as required to complete systems. Flashing and trim shall be sheet aluminum finished to match storefront framing unless otherwise indicated.

1. Flashing and Trim Thickness: Provide the following minimum thicknesses.

   a. Widths 4 inches or less: 0.050 inch.
   b. Widths greater than 4 inches but less than or equal to 7 inches: 0.062 inch
   c. Widths greater than 7 inches: 0.090 inch.

2. Concealed Flashing: Dead-soft, 0.018-inch-thick stainless steel, ASTM A 240/A 240M of type recommended by manufacturer.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

C. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

D. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

E. Framing Sealants: Manufacturer's standard sealants compliant with project requirements.

F. Rigid PVC Filler: For backer rod support.

## 2.7 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 interior.
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. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.8 GENERAL FINISH REQUIREMENTS

A. 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.

2.9 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: Dark bronze.

**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

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 9200 "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.

K. Install glazing as specified in Section 08 8000 "Glazing."

3.3 ERECTION TOLERANCES

A. Install aluminum-framed entrance and storefront systems to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:

   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
   c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Inspections: Engage manufacturer's technical representative to inspect installation, flashings, and other components, and to furnish reports to Architect. Site representative shall be present on site as follows:

1. Beginning of Installation.
2. Interim Inspections: A minimum of 1 unannounced inspection.
3. Final Inspection: Inspect completed installation, including perimeter sealants and weeps.

B. Aluminum-framed entrance and storefront systems will be considered defective if they do not pass tests and inspections.

1. Submit reports for each test and inspection, describing problems observed and corrections made.

C. Additional testing and inspecting, at Contractor's expense, shall be performed to determine if replaced or additional work complies with specified requirements.

3.5 ADJUSTING AND CLEANING

A. Clean exposed entrance and storefront surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore entrances and storefronts damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged elements and replace with new elements.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

**END OF SECTION**

## SECTION 08 4246 – WOOD ENTRANCES

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes aluminum-clad wood entrance doors.

B. Related Requirements:
1. Section 08 5200 "Wood Windows" for related aluminum-clad wood windows, sidelites, and mullions and for coordinating finishes among fenestration units on the building exterior.
2. Section 08 71 00 “Door Hardware” for additional entrance door hardware.
3. Section 08 8000 “Glazing” for door glazing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review, discuss, and coordinate the interrelationship of wood windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of wood entrance door.

1. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.

B. Shop Drawings: For wood entrance doors.

1. Include plans, elevations, sections, and details; hardware; attachments to other work, and between doors, if any; and operational clearances.

C. Samples: For each exposed product and for each color specified, 2 by 4 inches (50 by 100 mm) in size.

1. Include Samples of hardware and accessories involving color selection.

D. Samples for Verification: For wood entrance doors and components required, prepared on Samples of size indicated below:

1. Exterior Finishes: 2 by 4 inches (50 by 100mm).
2. Interior Finishes: 12 inches in length.

E. Product Schedule: For wood entrance doors. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each wood entrance door, for tests performed by a qualified testing agency; and for each class and performance grade indicated, tested at AAMA gateway size.

C. Field quality-control reports.

D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes, weather stripping, operable panels, and operating hardware to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating wood entrance doors that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

B. Installer Qualifications: An installer acceptable to wood entrance door manufacturer for installation of units required for this Project.

1.7 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of wood entrance doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection.
c. Faulty operation of movable panels and hardware.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Wood entrance Door: 10 years from date of Substantial Completion.
b. Insulating-Glass Units: 20 years from date of Substantial Completion.
c. Aluminum Finish: 20 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Source Limitations: Obtain wood entrance doors from single source from single manufacturer.

1. Products of this Section shall be obtained from the same manufacturer as the products of Section 08 5200 "Wood Windows".

## 2.2 PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Product Certification: AMMA certified with label attached to each door.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: Class LC.
2. Minimum Performance Grade: Grade 60.

C. Thermal Transmittance: NFRC 100 maximum total fenestration product U-factor of 0.32 Btu/sq. ft. x h x deg F.

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum total fenestration product SHGC of 0.30.

E. Condensation-Resistance Factor (CRF): Provide wood entrance doors tested for thermal performance according to AAMA 1503, showing a CRF of 52.

F. Thermal Movements: Provide wood entrance doors, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

## 2.3 WOOD ENTRANCE DOORS

A. Aluminum-Clad Wood Entrance Doors:

1. Basis-of-Design Product: Pella, “Architect Series Reserve” – factory assembled aluminum clad wood French doors with outward swing door panels installed in frame. Provide indicated product, or subject to compliance with requirements, comparable product acceptable to the Architect by one of the following:

   a. EAGLE Window & Door, Inc.; a subsidiary of Andersen Corporation.
   b. Kolbe & Kolbe Millwork Co., Inc.
   c. Marvin Windows and Doors.
   d. Pella Corporation.

2. Exterior Finish: Aluminum-clad wood.

   a. Aluminum Finish: Manufacturer's standard fluoropolymer two-coat system with fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight and complying with AAMA 2605.
   b. Color: As selected by Architect from manufacturer's full range.

3. Interior Finish: Manufacturer's standard stain-and-varnish finish.

   a. Exposed Unfinished Wood Surfaces: Manufacturer’s standard species.
   b. Color: As selected by Architect’s from manufacturer’s full range.

B. Frames and Door Panels: Fabricated from aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames and door panels with an integral, concealed, low-conductance thermal barrier located between exterior and interior surfaces in a manner that eliminates direct metal-to-metal contact.

C. Threshold: Provide low-profile extruded-aluminum threshold; designed to comply with performance requirements indicated and to drain to the exterior.

1. Low-Profile Threshold: ADA-ABA compliant.
2. Finish: Mill finish.

D. Jamb Extensions: Factory applied.

E. Insulating-Glass Units: Section 08 8000 “Glazing”.

F. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

## 2.4 HARDWARE

A. General: Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with aluminum complying with AAMA 907 and designed to smoothly operate, tightly close, and securely lock wood entrance doors.

1. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 7100 "Door Hardware."

B. Lock: Install manufacturer's standard keyed multipoint locking device on each operable panel, lockable from the inside and outside.

1. Design: As selected from manufacturer's full range.
2. Finish: Satin nickel.
3. Keying System: Keyed to match other building entrances.

C. Weather Stripping: Manufacturer's standard replaceable components.

D. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

## 2.5 ACCESSORIES

A. Simulated Divided Lites: Provide grilles in configuration indicated on Drawings and as follows:
1. Grilles between lites: Provide grilles permanently installed between lites of insulating glass in color selected by Architect from manufacturer’s full range.
2. Material: Manufacturer's standard.
3. Pattern: As indicated on Drawings.
4. Profile: Manufacturer's standard contoured profile.
5. Width: 3/4 inch.

B. Fasteners: Noncorrosive and compatible with door members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

C. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for wood entrance doors, complying with ASTM B 456 or ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

2.6 FABRICATION

A. Fabricate wood entrance doors in sizes indicated. Include a complete system for assembling components and anchoring doors.

B. Fabricate wood entrance doors that are reglazable without dismantling panel framing.

C. Hardware: Reinforce doors as required for installing entrance door hardware, including hardware provided in Section 08 7100 “Door Hardware”.

1. Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

D. Weather Stripping: Provide full-perimeter weather stripping for each door panel.

E. Weep Holes: Provide weep holes and internal drainage passages to conduct infiltrating water to exterior.

F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

G. Factory-Glazed Fabrication: Glaze wood entrance doors in the factory where practical and possible for applications indicated. Comply with requirements in Section 08 8000 "Glazing" and with AAMA/WDMA/CSA 101/I.S.2/A440.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.

B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight wood entrance door installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing doors, hardware, accessories, and other components.

B. Install wood entrance doors level, plumb, square, true to line; without distortion, warp, or rack of frames and panels and without impeding thermal movement; anchored securely in place to structural support; and in proper relation to wall flashing, vapor retarders, air barriers, water/weather barriers, and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.

D. Install wood entrance doors and components to drain condensation, water-penetrating joints, and moisture migrating within doors to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

F. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

## 3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Test and inspect installed wood entrance doors as follows:

1. Testing Methodology: Test wood entrance doors for air infiltration and water resistance according to AAMA 502.
2. Air-Infiltration Testing:

   a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
   b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
   c. Perform a minimum of four tests at each building in areas as selected by Architect.
   d. Failed Tests: Perform one additional test at location selected by Architect for each failed test.

3. Test Reports: Prepared according to AAMA 502.

C. Wood entrance door will be considered defective if it does not pass tests and inspections.

1. Submit reports for each inspection, describing problems observed and corrections made.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Lubricate hardware and moving parts.

B. Adjust operating panels to provide a tight fit at contact points and weather stripping for smooth operation, without binding, and a weathertight closure. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.

C. Clean exposed surfaces immediately after installing wood entrance doors. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, excess sealants, glazing materials, dirt, and other substances.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect wood entrance door surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances contact wood entrance door surfaces, remove contaminants immediately according to manufacturer's written instructions.

F. Refinish or replace wood entrance doors with damaged finishes.

G. Replace damaged components.

**END OF SECTION**

## SECTION 08 5200 - WOOD WINDOWS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes aluminum-clad wood windows.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review, discuss, and coordinate the interrelationship of wood windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
   3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
   4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for wood windows.

B. Shop Drawings: For wood windows.
   1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified, 2 by 4 inches (50 by 100 mm) in size.

D. Samples for Initial Selection: For units with factory-applied finishes.
   1. Include Samples of hardware and accessories involving color selection.

E. Samples for Verification: For wood windows and components required, prepared on Samples of size indicated below:
   1. Exposed Finishes: 2 by 4 inches (50 by 100 mm).
   2. Exposed Hardware: Full-size units.

F. Product Schedule: For wood windows. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each type of wood window, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For manufacturer's warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to wood window manufacturer for installation of units required for this Project.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:

      a. Failure to meet performance requirements.
      b. Structural failures including excessive deflection, water leakage, and air infiltration.
      c. Faulty operation of movable sash and hardware.
      d. Deterioration of materials and finishes beyond normal weathering.
      e. Failure of insulating glass.
   2. Warranty Period:

      a. Window: 10 years from date of Substantial Completion.
      b. Glazing Units: 20 years from date of Substantial Completion.
      c. Aluminum-Cladding Finish: 20 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Source Limitations: Obtain wood windows from single source from single manufacturer.

   1. Products of this Section shall be obtained from the same manufacturer as the products of Section 08 5200 "Wood Windows".

2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
   1. Window Certification: WDMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
   1. Minimum Performance Class: CW.
   2. Minimum Performance Grade: 40.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.35 Btu/sq. ft. x h x deg F (2.0 W/sq. m x K).

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.

2.3 WOOD WINDOWS

A. Aluminum-Clad Wood Windows:

B. Basis-of-Design Product: Pella “Reserve-Traditional”. Provide indicated product, or subject to compliance with requirements, comparable product acceptable to the Architect by one of the following:
   1. EAGLE Window & Door, Inc; an Andersen Window & Door company.

2. Marvin Windows and Doors.

C. Operating Types: Provide the following operating types in locations indicated on Drawings:
1. Double hung.
2. Fixed.

D. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch (0.8 mm) deep by 2 inches (51 mm) wide; water-repellent preservative treated.
1. Exterior Finish: Aluminum-clad wood.
   a. Aluminum Finish: Manufacturer's standard fluoropolymer two-coat system with fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight and complying with AAMA 2605.
   b. Color: As selected by Architect from manufacturer's full range.
2. Interior Finish: Manufacturer's standard stain-and-varnish finish.
   a. Exposed Unfinished Wood Surfaces: White Oak.
   b. Color: Natural.

E. Insulating-Glass Units: Section 08 8000 “Glazing”.

F. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

G. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

H. Projected Window Hardware:
1. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches (735 mm) tall and two arms on taller sashes.

I. Hung Window Hardware:
1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

J. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

K. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

## 2.4 ACCESSORIES

A. Simulated Divided Lites: Provide grilles in configuration indicated on Drawings and as follows:
1. Grilles between lites: Provide grilles permanently installed between lites of insulating glass in color selected by Architect from manufacturer’s full range.
2. Material: Manufacturer's standard.
3. Pattern: As indicated on Drawings.
4. Profile: Manufacturer's standard contoured profile.

5. Width: 3/4 inch.

2.5 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
   1. Type and Location: Full, outside for double-hung sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
   1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
   2. Finish for Exterior Screens: Matching color and finish of cladding.

C. Glass-Fiber Mesh Fabric: 18-by-14 (1.1-by-1.4-mm) or 18-by-16 (1.0-by-1.1-mm) mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D3656/D3656M.
   1. Mesh Color: Manufacturer's standard.

2.6 FABRICATION

A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze wood windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.

E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action (dissimilar materials, treated lumber, etc.) at the points of contact with other materials.

D. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating foam sealant.

E. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly.

F. Leave windows closed and locked.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
   1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

**END OF SECTION**

# SECTION 08 7100 - DOOR HARDWARE

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:

   a. "Metal Doors and Frames"
   b. "Flush Wood Doors"
   c. "Stile and Rail Wood Doors"
   d. "Interior Aluminum Doors and Frames"
   e. "Aluminum-Framed Entrances and Storefronts"
   f. "Stainless Steel Doors and Frames"
   g. "Special Function Doors"
   h. "Entrances"

6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

### 1.2 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

## 1.3 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:

   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

   a. Wiring Diagrams: For power, signal, and control wiring and including:

      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:

   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:

      1) Door Index: door number, heading number, and Architect's hardware set number.
      2) Quantity, type, style, function, size, and finish of each hardware item.
      3) Name and manufacturer of each item.
      4) Fastenings and other pertinent information.
      5) Location of each hardware set cross-referenced to indications on Drawings.

6) Explanation of all abbreviations, symbols, and codes contained in schedule.
7) Mounting locations for hardware.
8) Door and frame sizes and materials.
9) Degree of door swing and handing.
10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:

a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:

a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:

a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Final approved hardware schedule edited to reflect conditions as installed.
d. Final keying schedule
e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:

a. Fire door assemblies, in compliance with NFPA 80.
b. Required egress door assemblies, in compliance with NFPA 101.

## 1.4 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware

Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

    a. For door hardware: DHI certified AHC or DHC.
    b. Can provide installation and technical data to Architect and other related subcontractors.
    c. Can inspect and verify components are in working order upon completion of installation.
    d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:

    a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
    b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:

    a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
    b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

3. Electrified Door Hardware

    a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

4. Accessibility Requirements:

    a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference

    a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

        1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
        2) Preliminary key system schematic diagram.
        3) Requirements for key control system.
        4) Requirements for access control.
        5) Address for delivery of keys.

2. Pre-installation Conference

    a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Inspect and discuss preparatory work performed by other trades.
    c. Inspect and discuss electrical roughing-in for electrified door hardware.
    d. Review sequence of operation for each type of electrified door hardware.

e. Review required testing, inspecting, and certifying procedures.
f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:

a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

## 1.6 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

## 1.7 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.

a. Mechanical Warranty

1) Locks

a) 10 years

2) Exit Devices

a) 10 years

3) Closers

a) 10 years

4) Automatic Operators

a) LCN: 2 years
b) Falcon: 1 year

b. Electrical Warranty

1) Locks

a) 1 year

2) Exit Devices

a) 1 year

1.8 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

## 2.3 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Ives 5BB series

2. Acceptable Manufacturers and Products:

   a. McKinney TB series
   b. Best FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:

   a. Exterior: Heavy weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
   b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

4. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:

   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
   b. Interior: Heavy weight, steel, 5 inches (127 mm) high

5. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
6. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

8. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

## 2.4 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:

   a. Ives

2. Acceptable Manufacturers:

   a. Select

b. Best

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

## 2.5 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:

   a. Von Duprin EPT-10

2. Acceptable Manufacturers and Products:

   a. Security Door Controls PTM
   b. Precision EPT-12C

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

## 2.6 DOOR CORDS

A. Manufacturers:

1. Scheduled Manufacturer and Product:

   a. Schlage 788/798 Series

2. Acceptable Manufacturers and Products:

   a. Securitron TSB Series
   b. Camden CM Series

B. Requirements:

1. Provide door cords with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

## 2.7 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:

   a. Ives

2. Acceptable Manufacturers:

   a. Burns
   b. Trimco

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

## 2.8 SURFACE BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:

   a. Ives

2. Acceptable Manufacturers:

   a. Burns
   b. Trimco

B. Requirements:

1. Surface bolt s to have 1" throw for maximum security with concealed mounting that prevents vandalism. Units to be constructed of heavy-duty steel and UL listed up to three (3) hours when used on the inactive door of a pair up to 8' in height.

## 2.9 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer:

   a. Ives

2. Acceptable Manufacturers:

   a. Burns
   b. Trimco

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers, surface vertical rod exit device strikes, or other stop mounted hardware. Factory-prepared coordinators for vertical rod devices as specified.

## 2.10 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Falcon T series

2. Acceptable Manufacturers and Products:

a. Arrow QL series
b. Sargent 10-Line

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets.
8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.

a. Lever Design: Dane.

2.11 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

a. Falcon 24/25 series

2. Acceptable Manufacturers and Products:

a. Sargent 19-43-GL-80 series
b. Precision Apex series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide flush end caps for exit devices.
7. Provide exit devices with manufacturer's approved strikes.
8. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
11. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
12. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
13. Provide electrified options as scheduled.
14. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

## 2.12 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Locknetics

2. Acceptable Manufacturers:

   a. RCI
   b. Security Door Controls 25/45

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary resistant.
3. Provide electric strikes that are field selectable fail-safe and fail-secure.
4. Provide electric strikes cycle tested to endure a minimum of 250,000 cycles.
5. Where required, provide electric strikes UL Listed for fire doors and frames.
6. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

## 2.13 MAGNETIC LOCKS

A. Manufacturers:

1. Scheduled Manufacturer:

   a. Schlage

2. Acceptable Manufacturers:

   a. Securitron
   b. Security Door Controls

B. Requirements:

1. Provide magnetic locks certified to meet ANSI/BHMA A156.23 classification criteria, UL10C, and UL1034 for burglary-resistant electronic locking mechanisms.
2. Provide magnetic locks equipped with SPDT Magnetic Bond Sensing device, where specified, to monitor whether enough magnetic holding force exists to ensure adequate locking and SPDT Door Status Monitor device, where specified, to monitor whether door is open or closed. Provide bond sensors fully concealed within electromagnet to resist tampering or damage.
3. Provide fasteners, mounting brackets, and spacer bars required for mounting and details.
4. Provide power supply recommended and approved by manufacturer of magnetic locks.
5. Where magnetic locks are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of magnetic locks for each individual leaf. Switches control both doors simultaneously at pairs. Locate controls as directed by Architect.

## 2.14 PASSIVE INFRARED MOTION SENSORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Schlage SCAN II Series

2. Acceptable Manufacturers and Products:

   a. Securitron XMS Series
   b. Security Door Controls MD-31D Series

B. Requirements:

1. Provide motion sensors as specified in hardware groups.

## 2.15 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Schlage/Von Duprin PS900 Series

2. Acceptable Manufacturers and Products:

   a. Sargent 3500 series
   b. Security Door Controls 600 series

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:

   a. 12/24 VDC Output, field selectable.
   b. Class 2 Rated power limited output.
   c. Universal 120-240 VAC input.
   d. Low voltage DC, regulated and filtered.
   e. Polarized connector for distribution boards.
   f. Fused primary input.
   g. AC input and DC output monitoring circuit w/LED indicators.
   h. Cover mounted AC Input indication.
   i. Tested and certified to meet UL294.
   j. NEMA 1 enclosure.
   k. Hinged cover w/lock down screws.
   l. High voltage protective cover.

## 2.16 CYLINDERS

A. Manufacturers and Products:

1. Scheduled Manufacturer:

   a. Falcon

2. Acceptable Manufacturers and Products:

   a. Arrow
   b. Sargent

B. Requirements:

1. Provide cylinders/cores compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset; manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

   a. Open: cylinder with small format interchangeable core (SFIC) and standard cores with open keyway

2.17 KEYING

A. Scheduled System:

1. New factory registered system:

a. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Permanent Keying:

a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.

1) Master Keying system as directed by the Owner.

b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.

c. Provide keys with the following features:

1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)

d. Identification:

1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
2) Identification stamping provisions must be approved by the Architect and Owner.
3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

e. Quantity: Furnish in the following quantities.

1) Permanent Control Keys: 3.
2) Master Keys: 6.
3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
4) Key Blanks: Quantity as determined in the keying meeting.

2.18 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer:

a. Telkee

2. Acceptable Manufacturers:

a. HPC
b. Lund

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.

a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
b. Provide hinged-panel type cabinet for wall mounting.

## 2.19 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. Falcon SC70A series

2. Acceptable Manufacturers and Products:

   a. LCN 4050 series
   b. Sargent 351 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with aluminum cylinder.
3. Closer Body: 1-1/2-inch (38 mm) diameter with 5/8-inch (16 mm) diameter heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

## 2.20 ELECTRO-HYDRAULIC AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:

   a. LCN 4600 series

2. Acceptable Manufacturers and Products:

   a. Norton 6000 series
   b. Precision D4990 series

B. Requirements:

1. Provide low energy automatic operator units with hydraulic closer complying with ANSI/BHMA A156.19.
2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
3. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
5. Provide drop plates, brackets, and adapters for arms as required for details.
6. Provide actuator switches and receivers for operation as specified.
7. Provide weather-resistant actuators at exterior applications.
8. Provide key switches with LED's, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to "KEYING" article, herein.

9. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
10. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.21 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Burns
b. Trimco

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.22 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Burns
b. Trimco

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.23 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:

a. Glynn-Johnson

2. Acceptable Manufacturers:

a. Rixson
b. Sargent

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.24 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:

a. Ives

2. Acceptable Manufacturers:

a. Burns
b. Trimco

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.25 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:

a. Zero International

2. Acceptable Manufacturers:

a. National Guard
b. Reese

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.26 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Weatherstripping: Clear Anodized Aluminum
9. Thresholds: Mill Finish Aluminum

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Furnish permanent cores to GC for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

M. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

S. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

## 3.3 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.

1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

## 3.4 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

## 3.5 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to 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.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

103779 OPT0212059

V3 12/12/2023 vs. V4 12/20/2023

Hardware Group No. 01

For use on Door #(s):
118

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 NRP | | 630 | IVE |
| 1 | EA | DOOR CORD | 798-18 LESS WIRES | | 626 | SCE |
| 1 | EA | PANIC HARDWARE | 24-V-EO-LBR-SHIMS | | 626 | FAL |
| 1 | EA | ELEC PANIC HARDWARE | MEL-24-V-NL-OP-LBR-SHIMS 24 VDC | | 626 | FAL |
| 1 | EA | RIM HOUSING | C953 | | 626 | FAL |
| 1 | EA | SFIC CORE | C606 | | 626 | FAL |
| 2 | EA | LONG DOOR PULL | 9264F 60" 44" O | | 630-316 | IVE |
| 1 | EA | SURFACE CLOSER | SC71A SS | | 689 | FAL |
| 1 | EA | SURF. AUTO OPERATOR | 4642 WMS 120 VAC | | 689 | LCN |
| 2 | EA | ACTUATOR, WALL MOUNT | 8310-856T | | 630 | LCN |
| 1 | EA | MOUNTING PLATE | SC70A-18PA | | 689 | FAL |
| 1 | EA | POWER SUPPLY | PS902 900-2RS 120/240 VAC | | LGR | SCE |
| 1 | EA | NOTE | WEATHERSTRIPPING, MEETING STILE SEALS, THRESHOLD, SWEEP BY DOOR/FRAME SUPPLIER | | UNF | BYO |

CREDENTIAL READER DEVICE IS TO RETRACT THE LATCH AND ENABLE THE PULL SIDE AUTO-OPERATOR ACTUATOR BUTTON ALLOWING MANUAL OR AUTOMATIC INGRESS. IMMEDIATE MANUAL OR AUTOMATIC EGRESS IS ALSO AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

POWER FOR THE AUTO-OPERATOR IS BY THE ELECTRICAL CONTRACTOR.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE MEL ELECTRIC LATCH RETRACTION FEATURE INSIDE THE PANIC HARDWARE AS WELL AS WIRING TO THE MEL FEATUR EITSELF.
3) WIRING TO THE AUTO-OPERATOR.

Hardware Group No. 02

For use on Door #(s):
104

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 NRP | | 630 | IVE |
| 1 | EA | DOOR CORD | 798-18 LESS WIRES | | 626 | SCE |
| 1 | EA | PANIC HARDWARE | 24-V-EO-LBR-SHIMS | | 626 | FAL |
| 1 | EA | ELEC PANIC HARDWARE | MEL-24-V-NL-OP-LBR-SHIMS 24 VDC | | 626 | FAL |
| 1 | EA | RIM HOUSING | C953 | | 626 | FAL |
| 1 | EA | SFIC CORE | C606 | | 626 | FAL |
| 2 | EA | LONG DOOR PULL | 9264F 60" 44" O | | 630-316 | IVE |
| 1 | EA | SURFACE CLOSER | SC71A SS | | 689 | FAL |
| 1 | EA | SURF. AUTO OPERATOR | 4642 WMS 120 VAC | | 689 | LCN |
| 2 | EA | ACTUATOR, WALL MOUNT | 8310-856T | | 630 | LCN |
| 1 | EA | MOUNTING PLATE | SC70A-18PA | | 689 | FAL |
| 1 | EA | BOLLARD POST FOR ACTUATOR BUTTON AND CARD READER | VERIFY DESIRED STYLE WITH ARCHITECT PRIOR TO BIDDING OR ORDERING | | 630 | WIK |
| 1 | EA | POWER SUPPLY | PS902 900-2RS 120/240 VAC | | LGR | SCE |
| 1 | EA | NOTE | WEATHERSTRIPPING, MEETING STILE SEALS, THRESHOLD, SWEEP BY DOOR/FRAME SUPPLIER | | UNF | BYO |

CREDENTIAL READER DEVICE IS TO RETRACT THE LATCH AND ENABLE THE PULL SIDE AUTO-OPERATOR ACTUATOR BUTTON ALLOWING MANUAL OR AUTOMATIC INGRESS. IMMEDIATE MANUAL OR AUTOMATIC EGRESS IS ALSO AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

POWER FOR THE AUTO-OPERATOR IS BY THE ELECTRICAL CONTRACTOR.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) WIRING TO THE PS902 POWER SUPPLY, WHICH POWERS THE MEL ELECTRIC LATCH RETRACTION FEATURE INSIDE THE PANIC HARDWARE AS WELL AS WIRING TO THE MEL FEATUR EITSELF.
3) WIRING TO THE AUTO-OPERATOR.

Hardware Group No. 03

For use on Door #(s):
106B 106D 106E 106F

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 NRP | | 630 | IVE |
| 1 | EA | REMOVABLE MULLION | 4954 STAB | | 689 | VON |
| 1 | EA | PANIC HARDWARE | LD-25-R-EO | | 626 | FAL |
| 1 | EA | PANIC HARDWARE | LD-25-R-L-DANE | | 626 | FAL |
| 1 | EA | MORTISE CYLINDER | C987 CAM AS REQUIRED | | 626 | FAL |
| 1 | EA | SFIC CORE | C606 | | 626 | FAL |
| 2 | EA | SURFACE CLOSER | SC71A SSHO | | 689 | FAL |
| 1 | EA | RAIN DRIP | 142AA | | AA | ZER |
| 2 | EA | MEETING STILE | 8193AA | | AA | ZER |
| 1 | SET | JAMB SEALS | 328AA-S | | 628 | ZER |
| 1 | EA | HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW) | 429A | | AA | ZER |
| 2 | EA | DOOR SWEEP | 39A | | A | ZER |
| 1 | EA | THRESHOLD | 566A-V3-223 | | A | ZER |

Hardware Group No. 04

For use on Door #(s):
106C

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 NRP | | 630 | IVE |
| 1 | EA | AUTO FLUSH BOLT | FB31P | | 630 | IVE |
| 1 | EA | DUST PROOF STRIKE | DP2 | | 626 | IVE |
| 1 | EA | STOREROOM LOCK | T581P6 DAN | | 626 | FAL |
| 1 | EA | COORDINATOR | COR X FL (MTG BRACKETS AS REQD) | | 628 | IVE |
| 2 | EA | OH STOP & HOLDER | 90H - PROVIDE SHIMS AS REQD | | 630 | GLY |
| 2 | EA | SURFACE CLOSER | SC71A REG (PULL SIDE MTD) | | 689 | FAL |
| 2 | EA | KICK PLATE | 8400 10" X 1" LDW B-CS | | 630 | IVE |
| 1 | SET | OVERLAPPING ASTRAGAL | 322A-S | | A | ZER |
| 1 | SET | JAMB SEALS | 328AA-S | | 628 | ZER |
| 1 | EA | HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW) | 429A | | AA | ZER |
| 2 | EA | DOOR SWEEP | 39A | | A | ZER |
| 1 | EA | ASTRAGAL | 43SP | | SP | ZER |
| 1 | EA | THRESHOLD | 566A-V3-223 | | A | ZER |

Hardware Group No._05

For use on Door #(s):
203

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 6 | EA | HINGE(S) | PROVIDED BY PRE-HUNG DOOR MANUFACTURER | | 630 | MIS |
| 2 | EA | SURFACE BOLT | SB453 12" TB | | 652 | IVE |
| 1 | EA | DBL CYL DEADBOLT | D231B | | 626 | FAL |
| 2 | EA | SFIC CORE | C606 | | 626 | FAL |
| 2 | EA | OH STOP & HOLDER | 90F | | 630 | GLY |
| 1 | EA | NOTE | WEATHERSTRIPPING, MEETING STILE SEALS, THRESHOLD, SWEEP BY DOOR/FRAME SUPPLIER | | UNF | BYO |

Hardware Group No. 06

For use on Door #(s):
132

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1HW 4.5 X 4.5 NRP | | 630 | IVE |
| 1 | EA | STOREROOM LOCK | T581P6 DAN | | 626 | FAL |
| 1 | EA | SURFACE CLOSER | SC71A SS | | 689 | FAL |
| 1 | SET | JAMB SEALS | 328AA-S | | 628 | ZER |
| 1 | EA | HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW) | 429A | | AA | ZER |
| 1 | EA | DOOR SWEEP | 39A | | A | ZER |
| 1 | EA | THRESHOLD | 566A-V3-223 | | A | ZER |

Hardware Group No.07

For use on Door #(s):
105

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1HW 4.5 X 4.5 NRP | | 630 | IVE |
| 1 | EA | STOREROOM LOCK | T581P6 DAN | | 626 | FAL |
| 1 | EA | ELECTRIC STRIKE | CS750 12/24 VDC | | 630 | LOC |
| 1 | EA | SURF. AUTO OPERATOR | 4642 WMS 120 VAC | | 689 | LCN |
| 2 | EA | ACTUATOR, WALL MOUNT | 8310-856T | | 630 | LCN |
| 1 | SET | JAMB SEALS | 328AA-S | | 628 | ZER |
| 1 | EA | HEAD SEAL (MOUNT PRIOR TO OTHER HEAD MTD HDW) | 429A | | AA | ZER |
| 1 | EA | DOOR SWEEP | 39A | | A | ZER |
| 1 | EA | THRESHOLD | 566A-V3-223 | | A | ZER |

POWER FOR THE AUTO-OPERATOR IS BY THE ELECTRICAL CONTRACTOR. POWER FOR THE ELECTRIC STRIKE IS BY THE ON-BOARD POWER SUPPLY INSIDE THE AUTO-OPERATOR.

Hardware Group No. 08

For use on Door #(s):
106H

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | | 652 | IVE |
| 1 | EA | PANIC HARDWARE | LD-25-R-L-DANE | | 626 | FAL |
| 1 | EA | MORTISE CYLINDER | C987 CAM AS REQUIRED | | 626 | FAL |
| 1 | EA | SFIC CORE | C606 | | 626 | FAL |
| 1 | EA | ELECTRIC STRIKE | RS300 12/24 VDC | | 630 | LOC |
| 1 | EA | SURF. AUTO OPERATOR | 4631 WMS 120 VAC | | 689 | LCN |
| 2 | EA | ACTUATOR, WALL MOUNT | 8310-856T | | 630 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | | 630 | IVE |
| 1 | EA | GASKETING | 328AA | | AA | ZER |
| 1 | EA | DOOR SWEEP | 39A | | A | ZER |
| 1 | EA | THRESHOLD | 566A-V3-223 | | A | ZER |

POWER FOR THE AUTO-OPERATOR IS BY THE ELECTRICAL CONTRACTOR. POWER FOR THE ELECTRIC STRIKE IS BY THE ON-BOARD POWER SUPPLY INSIDE THE AUTO-OPERATOR.

Hardware Group No. 09

For use on Door #(s):
105A

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1HW 4.5 X 4.5 | | 652 | IVE |
| 2 | EA | 90 DEG OFFSET PULL | 8190EZHD 10" O | | 630-316 | IVE |
| 2 | EA | PULL PLATE | 8305 10" 4" X 16" | | 630 | IVE |
| 2 | EA | SURFACE CLOSER | SC71A SSHO | | 689 | FAL |

Hardware Group No. 10

For use on Door #(s):
106A

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | | 652 | IVE |
| 1 | EA | POWER TRANSFER | EPT10 | | 689 | VON |
| 1 | EA | EU STOREROOM LOCK | T881P6 DAN 12/24 VDC | | 626 | FAL |
| 1 | EA | SURFACE CLOSER | SC71A SS | | 689 | FAL |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | | 630 | IVE |
| 1 | EA | GASKETING | 488SBK PSA | | BK | ZER |

CREDENTIAL READER DEVICE IS TO RELEASE THE ELECTRIFIED LOCK ALLOWING INGRESS. IMMEDIATE EGRESS IS ALWAYS AVAILABLE. KEYED INGRESS IS ALSO AVAILABLE.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE ELECTRIFIED LOCK.

Hardware Group No. 11

For use on Door #(s):
104A

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | | 652 | IVE |
| 2 | EA | MANUAL FLUSH BOLT | FB458 | | 626 | IVE |
| 1 | EA | DUST PROOF STRIKE | DP2 | | 626 | IVE |
| 1 | EA | STOREROOM LOCK | T581P6 DAN | | 626 | FAL |
| 2 | EA | WALL STOP | WS406/407CCV | | 630 | IVE |

Hardware Group No. 12

For use on Door #(s):
122

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|---|---|---|---|---|---|
| 1 | EA | NOTE: | ALL EXISTING HARDWARE TO REMAIN | UNF | MIS |
| 1 | EA | NOTE: | FIELD VERIFICATION REQUIRED TO VERIFY NEW HARDWARE WORKS WITH EXST DOOR/FRAME | UNF | MIS |

Hardware Group No. 13

For use on Door #(s):
001

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|---|---|---|---|---|---|
| 1 | EA | PASSAGE FUNCTION LEVER | FIELD VERIFY CURRENT FUNCTION TO DETERMINE EXACT PART # REQ'D | 626 | FAL |
| 1 | EA | MAGNETIC LOCK | M490 12/24 VDC | 628 | SCE |
| 1 | EA | OH STOP & HOLDER | 90H J | 630 | GLY |
| 1 | EA | PUSH BUTTON | 623GIDEX DA 12/24 VDC | 630 | SCE |
| 1 | EA | MOTION SENSOR | SCANII 12/24 VDC | BLK | SCE |
| 1 | EA | NOTE: | FIELD VERIFICATION REQUIRED TO VERIFY NEW HARDWARE WORKS WITH EXST DOOR/FRAME | UNF | MIS |
| 1 | EA | NOTE: WHERE PROPER REINFORCEMENT IN THE FRAME IS NOT PRESENT | PROVIDE "RIV-NUT" TYPE FASTENERS TO ATTACH NEW HARDWARE TO EXISTING FRAME | UNF | MIS |

CREDENTIAL READER DEVICE ON THE PULL SIDE IS TO RELEASE THE MAGNETIC LOCKS ALLOWING INGRESS.

MOTION SENSOR OR WALL MOUNTED PUSH BUTTON ON THE PUSH SIDE RELEASE THE MAGNETIC LOCKS ALLOWING EGRESS.

THE 623GIDEX WALL MOUNTED PUSH BUTTON IS TO BE WIRED DIRECTLY BETWEEN THE MAGNETIC LOCKS AND THE PUSH BUTTON.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE MAGNETIC LOCKS, THE MOTION SENSOR AND THE WALL MOUNTED PUSH BUTTON.

Hardware Group No.14

For use on Door #(s):
125A

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 1 | EA | DOOR CORD | 798-18 LESS WIRES | | 626 | SCE |
| 1 | EA | PASSAGE FUNCTION LEVER | FIELD VERIFY CURRENT FUNCTION TO DETERMINE EXACT PART # REQ'D | | 626 | FAL |
| 1 | EA | RX SWITCH KIT | FIELD VERIFY EXIT DEVICE TO DETERMINE EXACT PART # REQ'D | | 626 | VON |
| 1 | EA | MAGNETIC LOCK | M490 12/24 VDC | | 628 | SCE |
| 1 | EA | PUSH BUTTON | 623GIDEX DA 12/24 VDC | | 630 | SCE |
| 1 | EA | NOTE: | FIELD VERIFICATION REQUIRED TO VERIFY NEW HARDWARE WORKS WITH EXST DOOR/FRAME | | UNF | MIS |
| 1 | EA | NOTE: WHERE PROPER REINFORCEMENT IN THE FRAME IS NOT PRESENT | PROVIDE "RIV-NUT" TYPE FASTENERS TO ATTACH NEW HARDWARE TO EXISTING FRAME | | UNF | MIS |

CREDENTIAL READER DEVICE ON THE PULL SIDE IS TO RELEASE THE MAGNETIC LOCKS ALLOWING INGRESS.

RX SWITCH INSIDE EXIT DEVICE OR WALL MOUNTED PUSH BUTTON ON THE PUSH SIDE RELEASE THE MAGNETIC LOCKS ALLOWING EGRESS.

THE 623GIDEX WALL MOUNTED PUSH BUTTON IS TO BE WIRED DIRECTLY BETWEEN THE MAGNETIC LOCKS AND THE PUSH BUTTON.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE MAGNETIC LOCKS, THE MOTION SENSOR AND THE WALL MOUNTED PUSH BUTTON.

Hardware Group No. 15

For use on Door #(s):
128B

Provide each PR door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | | FINISH | MFR |
|---|---|---|---|---|---|---|
| 2 | EA | DOOR CORD | 798-18 LESS WIRES | | 626 | SCE |
| 2 | EA | RX PUSHPAD | 692 RD SHK 12/24 VDC | | 628 | SCE |
| 1 | EA | PASSAGE FUNCTION TRIM | FIELD VERIFY EXISTING TRIM FUNCTION TO DETERMINE EXACT PART # REQ'D | | 626 | VON |
| 2 | EA | MAGNETIC LOCK | M490 12/24 VDC | | 628 | SCE |
| 1 | EA | PUSH PLATE | 8200 4" X 16" - USE TO BLANK OFF ONE OF THE TRIM PREPS | | 630 | IVE |
| 1 | EA | PUSH BUTTON | 623GIDEX DA 12/24 VDC | | 630 | SCE |
| 1 | EA | NOTE: | FIELD VERIFICATION REQUIRED TO VERIFY NEW HARDWARE WORKS WITH EXST DOOR/FRAME | | UNF | MIS |
| 2 | EA | NOTE: WHERE PROPER REINFORCEMENT IN THE FRAME IS NOT PRESENT | PROVIDE "RIV-NUT" TYPE FASTENERS TO ATTACH NEW HARDWARE TO EXISTING FRAME | | UNF | MIS |

CREDENTIAL READER DEVICE ON THE PULL SIDE IS TO RELEASE THE MAGNETIC LOCKS ALLOWING INGRESS.

RX PUSHPAD OR WALL MOUNTED PUSH BUTTON ON THE PUSH SIDE RELEASE THE MAGNETIC LOCKS ALLOWING EGRESS.

THE 623GIDEX WALL MOUNTED PUSH BUTTON IS TO BE WIRED DIRECTLY BETWEEN THE MAGNETIC LOCKS AND THE PUSH BUTTON.

ITEMS TO BE PROVIDED BY THE DIVISION 28 SUPPLIER:
1) CREDENTIAL READER DEVICE.
2) REQUIRED POWER AND WIRING TO THE MAGNETIC LOCKS, THE MOTION SENSOR AND THE WALL MOUNTED PUSH BUTTON.

Hardware Group No. 16

For use on Door #(s):

| | | | | | |
|---|---|---|---|---|---|
| 121 | 124 | 125B | 128A | 201 | 206A |
| 206B | 206C | 206D | 206E | | |

Provide each SGL door(s) with the following:

| QTY | | DESCRIPTION | CATALOG NUMBER | FINISH | MFR |
|---|---|---|---|---|---|
| 1 | EA | NOTE: | FIELD VERIFY EXISTING HARDWARE IS IN GOOD WORKING CONDITION | 626 | VON |
| 1 | EA | NOTE: | ALL EXISTING HARDWARE TO REMAIN | UNF | MIS |

**END OF SECTION**

## SECTION 08 8000 - GLAZING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.
2. Insulating glass.
3. Glazing sealants.
4. Glazing tapes.
5. Miscellaneous glazing materials.

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters in accordance with ASTM C1036.

C. IBC: International Building Code.

D. IGU: Insulating glass unit.

E. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

C. Glazing Accessory Samples: For sealants, in 12-inch (300-mm) lengths.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass, documentation indicating compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturers of fabricated glass units.

B. Product Certificates: For glass and argon fill, if applicable.

C. Product Test Reports: For fabricated glass and glazing sealants, for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Fabricated-Glass Manufacturer Qualifications: A qualified manufacturer of fabricated glass units who is approved by primary glass manufacturer.

B. Manufacturer Qualifications for Insulating-Glass Units: Insulating glass units (IGU) shall be certified by the Insulating Glass Certification Council (IGCC) or the manufacturer shall have the following quality assurance program:

1. IGU manufacturers shall have a quality assurance program for the fabrication of insulating glass units in accordance with not less than the minimum requirements of IGMA TM-4000, "Insulating Glass Manufacturing Quality Procedures." The quality assurance program shall include provisions for the following, without limitation:

a. Inspection and testing major components used in the IGU assembly.
b. Inspection of overall workmanship related to overall unit size and thickness, cleanliness of air space, sealant bond to glass and to itself at corners, sealant for achieving minimum vapor transmission path, spacer position relative to the unit edge, uniformity of sealant application and possible holes or underfills, reporting of non-conforming products and pursuant corrective action, storage and handling, field inspection and reporting of non-conforming installed products and pursuant corrective action.

2. Argon Filled Insulated Glazing Units: Fabricator shall be IGCC/IGMA Certified for argon fill and perform argon testing at an IGCC/IGMA accredited laboratory at least annually. Argon filled units shall be permanently marked with this certification.

C. Installer Qualifications: An experienced Installer with not less than 5 years of successful experience with work of this Section on projects of similar scale and complexity.

D. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

E. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C).

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Primary Glass Manufacturers: Subject to compliance with requirements, provide primary glass products by one of the following:

1. Cardinal Glass Industries, Inc.
2. Guardian Industries Corp.
3. Pilkington North America (NSG).
4. Vetrotech Saint-Gobain.
5. Vitro Architectural Glass (formerly PPG Industries, Inc.)

B. Source Limitations for Glass:

1. Obtain coated glass from single source from single manufacturer.
2. Obtain each scheduled glazing type from single source from single manufacturer.

C. Source Limitations for Glazing Accessories: For each product and installation method, obtain from single source from single manufacturer.

### 2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:

1. Design Wind Pressures: As indicated on Drawings.
2. Maximum Lateral Deflection for Exterior Glass: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
3. Maximum Lateral Deflection for Interior Glass: Deflection normal to glazing plane at live load of not less than 5 psf, is limited to 1/175 of clear span or 5/8 inch, whichever is less.

    a. Where interior glazing is installed adjacent to a walking surface, the differential deflection of two adjacent unsupported sides shall not be greater than the thickness of the panels or 1/2 inch, whichever is smaller, when a force of 50 pounds per linear foot is applied horizontally to one panel at any point up to 42 inches above the walking surface.
4. Thermal Loads: Design glazing to resist thermal stress breakage induced by differential temperature conditions and limited air circulation within individual glass lites and insulated glazing units.

D. Safety Glazing: Where safety glazing is indicated or required, provide glazing that complies with 16 CFR 1201, Category II.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.

2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on most current non-beta version of LBL's WINDOW computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
4. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program.
5. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

## 2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. NGA Publications: "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

## 2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

B. Heat Treated Glass:

1. Types:

a. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
b. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

a. Millidiopter: Maximum of plus or minus 100 millidiopter over 95 percent of the glass surface for glass without ceramic frit or ink that is 1/4 to 3/8 inch thick.

3. Roller-Wave Distortion: Roller-wave distortion shall not exceed the following dimensions from peak to valley:

a. Central Area of Glass: 0.003 inches.
b. Within 10.5 Inches of Leading and Trailing Edge of Glass: 0.008 inches.

4. Maintain measurement documentation for each lite. Upon request provide documentation for verification.

C. Low-E-Coated Vision Glass: ASTM C1376.

## 2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

1. Sealing System: Dual seal, with glazing unit fabricator's recommended primary and secondary sealants.

a. Low-E coatings shall not contact sealing system.

2. Perimeter Spacer: Glazing unit fabricator's recommended warm edge spacer meeting indicated unit performance requirements.

a. Color: Manufacturer's standard.

3. Desiccant: Molecular sieve or silica gel, or a blend of both.
4. Argon Fill: Argon fill, if used, unit interspace shall contain not less than 90 percent argon.
5. Source Quality Control: Test units in accordance with ASTM E2190.

## 2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, glass coatings, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing, field experience, and ASTM C1087.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Field-applied sealants shall have a VOC content of not more than 250 g/L.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.

## 2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Gaskets: Glass manufacturer's and fenestration manufacturer's recommended resilient elastomeric glazing gaskets. PVC gaskets shall not be acceptable for exterior glazing.

D. Setting Blocks: Elastomeric material recommended by sealant or glass manufacturer with a Shore, Type A durometer hardness of 85, plus or minus 5.

E. Spacers: Elastomeric blocks or continuous extrusions recommended by sealant or glass manufacturer of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

F. Edge Blocks: Elastomeric material recommended by sealant or glass manufacturer of hardness required to limit glass lateral movement (side walking).

G. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

H. Butt-Glazed Interior Glazing Joint Fillers: Clear plastic/silicone strips; provide profiles and sizes required by project conditions.

1. Basis-of-Design Products:

a. CR Laurence, "Clear Copolymer Strips for Glass-to-Glass Joints EZCC Series".
b. CR Laurence, "EZ Glaze Soundstrip EZ Series".

## 2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Butt-Glazed Lites: Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Exposed Edges and Corners: Grind smooth and polish exposed glass edges and corners.

1. Finished Edges: Flat polished unless otherwise indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

### 3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch- (3-mm-) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Exterior Glazing: Provide completed assemblies that maintain continuity of building enclosure air barrier and vapor retarder. Install heel beads of glazing sealant to glass panes at exterior glazing.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel

and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

## 3.7 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

## 3.8 GLAZING SCHEDULE, GENERAL

A. General:

1. Each lite shall be heat-treated as required by specific locations and conditions in accordance with specified Performance Requirements.
2. Safety Glazing: Provide safety glazing where indicated and where required by building code.

## 3.9 INTERIOR GLAZING SCHEDULE

A. Glass Type GL 04: Clear annealed float glass.

1. Minimum Thickness: 6 mm.
2. Provide safety glazing where required by code.

## 3.10 EXTERIOR GLAZING SCHEDULE

A. Glass Type GL 01: Insulated glazing, Clear glass, as indicated on the building elevations.

1. Overall Unit Thickness: 11/16 inch.
2. Minimum Thickness of Each Glass Lite: 2.5 mm.
3. Outboard Lite: Basis-of-Design Product: Vitro Solarban 60, Low-E coating on 2nd surface.
4. Heat Treatment of Outboard Lite: Heat strengthened, unless fully-tempered is required.
5. Interspace Content: As required to meet performance requirements.
6. Inboard Lite: Clear.
7. Visible Light Transmittance: 70 percent minimum.
8. Visible Light Reflectance (out): 11 percent maximum.
9. Winter Nighttime U-Factor: 0.29 maximum.
10. SHGC: 0.38 maximum.
11. Provide safety glazing where required by building code.

B. Glass Type GL 02: Insulated glazing, Clear glass, as indicated on the building elevations.

1. Overall Unit Thickness: 11/16 inch.
2. Minimum Thickness of Each Glass Lite: 2.5 mm.
3. Outboard Lite: Basis-of-Design Product: Vitro Solarban 60, Low-E coating on 2nd surface and internal muntins.
4. Heat Treatment of Outboard Lite: Heat strengthened, unless fully-tempered is required.
5. Interspace Content: As required to meet performance requirements.
6. Inboard Lite: Clear.
7. Visible Light Transmittance: 70 percent minimum.
8. Visible Light Reflectance (out): 11 percent maximum.
9. Winter Nighttime U-Factor: 0.29 maximum.
10. SHGC: 0.38 maximum.
11. Provide safety glazing where required by building code.

C. Glass Type GL 03: Insulated glazing, Clear glass, as indicated on the building elevations.

1. Overall Unit Thickness: 1 inch.
2. Minimum Thickness of Each Glass Lite: 6 mm.
3. Outboard Lite: Basis-of-Design Product: Vitro Glass, Clear.
4. Heat Treatment of Outboard Lite: Heat strengthened, unless fully-tempered is required.
5. Interspace Content: As required to meet performance requirements.
6. Inboard Lite: Clear.
7. Visible Light Transmittance: 79 percent minimum.
8. Visible Light Reflectance (out): 15 percent maximum.
9. Winter Nighttime U-Factor: 0.47 maximum.
10. SHGC: 0.70 maximum.
11. Provide safety glazing where required by building code.

**END OF SECTION**

## SECTION 09 0563 – FLOORING SUBSTRATE ACCEPTANCE STATEMENT

1.1 SUBSTRATE ACCEPTANCE STATEMENT

A. Where required by Division 09 flooring specifications, submit the statement on the following page prior to beginning of flooring installation.

1. Statement shall be submitted as follows:

a. Statement shall be on Installer's letterhead.
b. Statement shall be executed by an officer of the Installing company.

**END OF DOCUMENT**

# Flooring Substrate Acceptance Statement

**Project: Muellner Building Renovation**
**KS Project Number: 223010.00**

Date:_____

The following area of the building was tested: _____

Approximate Square Footage of Building Section: _____

Bounded by the following grid lines: _____

Including the following rooms:_____

Testing Agency: _____

Test #:_____ Date of Test: _____

RH Test High: _____ Low: _____ Average: _____

Based on test results and our professional judgment, we are proceeding as follows:

____ The results of the RH tests for the above listed area averaged _____%. This is above the required threshold of _____%. We will withhold flooring installation until provided direction from the Architect.

____ The results of the RH tests for the above listed area averaged _____%. This is acceptable to the flooring and adhesive manufacturers and below the required threshold of _____% requiring a moisture control system. We will take no action for this area, and will install flooring directly over the concrete slab.

See attached test report.

We have reviewed the flooring test results and accepts full responsibility for the performance of the entire flooring assembly and all components in the assembly based on the test results, test recommendations, and our visual inspection of the floor slab in the areas referenced in this document.

_____
Authorized Signature

_____
Title

_____
Installer Company Name

## SECTION 09 2216 - NON-STRUCTURAL METAL FRAMING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-structural steel framing systems for interior partitions.
2. Suspension systems for interior ceilings and soffits.
3. Grid suspension systems for gypsum board ceilings.

1.2 ACTION SUBMITTALS

A. Product Data: For each product.

1. Include manufacturer’s printed technical data including limiting height tables indicating products provided.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

B. Evaluation Reports: For high-strength steel studs and tracks, equivalent protective coatings, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified agency acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation upon request that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, the Steel Stud Manufacturers Association, or the Supreme Steel Framing System Association.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Notify manufacturer of damaged materials received prior to installation.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."

## PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

B. Design framing systems in accordance with AISI S220 and ASTM C645, Section 10, unless otherwise indicated. Design framing systems to accommodate deflection of primary building structure and construction tolerances and to withstand design loads.

C. Performance Criteria: Minimum base-metal thicknesses shall be increased as required according to the following:

1. Deflection Limit: L/240 except as follows:

   a. Walls with Tile Finishes: L/360.
   b. Ceilings, Bulkheads, and Soffits: L/360.

2. Span: Based on applicable floor-to-floor heights.
3. Loading: Accommodate applicable loading of walls with soffits, casework, and equipment, 5 psf minimum. Refer to Drawings and other Specifications for additional loading requirements.

D. Comparative Steel Thicknesses:

| Steel Sheet Thickness for Studs and Tracks | | | | | |
|---|---|---|---|---|---|
| Gage | Minimum Steel Base Steel (Uncoated) Thickness | | | | |
| | Steel | | High Strength Steel | | |
| | inch | mil | Designation | inch | mil |
| 20 | 0.033 | 33 | ProStud 33MIL | 0.0329 | 33 |
| | | | Viper 33mil | 0.0329 | 33 |
| 20 | 0.030 | 30 | ProStud 30MIL | 0.0296 | 30 |
| | | | Viper 30mil | 0.0296 | 30 |
| | | | ProStud 20 (70 ksi) | 0.0181 | 18 |
| | | | Viper20 (70 ksi) | 0.0180 | 18 |
| 25 | 0.018 | 18 | ProStud 25 (50 ksi) | 0.0150 | 15 |
| | | | Viper25 (50 ksi) | 0.0147 | 15 |

Yield Strength unless otherwise noted: 33 ksi
ProStud data from ClarkDietrich Building Systems.
Viper data from Marino\WARE.

2.2 FRAMING SYSTEMS

A. Framing Members, General:

1. Steel Sheet Components: Comply with AISI S220 and ASTM C645, Section 10 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A653/A653M, G40 hot-dip galvanized; or coating with equivalent corrosion resistance with an evaluation report acceptable to authorities having jurisdiction, unless otherwise indicated. Galvannealed products are unacceptable.

B. Studs and Track: AISI S220 and ASTM C645, Section 10. Unless otherwise indicated, use either steel studs and tracks or high-strength steel studs and tracks.

1. Steel Studs and Tracks:

a. Minimum Base-Steel Thickness: 0.0296 inch.
b. Depth: 3-5/8 inches unless otherwise indicated on Drawings.

2. High-Strength Steel Studs and Tracks:

a. Products: Subject to compliance with requirements, provide one of the following:

1) ClarkDietrich; “ProStud 20”.
2) Marino\WARE Metal Framing, “Viper20”.

b. Minimum Base-Steel Thickness: 0.0180 inch.
c. Depth: 3-5/8 inches unless otherwise indicated on Drawings.
d. Limitations: High-strength steel studs and tracks shall not be used at locations indicated to receive abuse-resistant or impact-resistant gypsum board.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Track System: Top track with not less than 2-inch-deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top track and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Slotted 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: Subject to compliance with requirements, provide one of the following:

1) CEMCO; California Expanded Metal Products Co.; CST Slotted Deflection Track or SLP-TRK Slotted Deflection Track.
2) ClarkDietrich; MaxTrak Slotted Deflection Track.
3) Marino\WARE Metal Framing: SLT Slotted Deflection Track.
4) MBA Building Supplies; FlatSteel Deflection Track or Slotted Deflecto Track.
5) Metal-Lite; The System.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width as required to support items anchored to walls. Refer to Drawings for additional backing details.

1. Minimum Base-Steel Thickness: 0.0598 inch.

E. Wood Backing Plate Assembly: Manufacturer's proprietary flexible wood backing assembly for blocking in metal stud wall systems consisting of fire-retardant plywood backer panels connected by metal hinge plates. System flexes around stud and snaps into place.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ClarkDietrich; “Danback”.

F. Bridging / Bracing Bar: Engineered, pre-notched, 0.0329 inch, galvanized sheet steel spacer bar for interior metal stud walls.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ClarkDietrich; “Spazzer Bar 9200”.
b. Steel Network, Inc.; “Bridge Bar”.

G. Cold-Rolled Channel Bridging (U-Channel): Steel, 0.0538-inch minimum base-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches unless otherwise indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels:

1. Minimum Base-Steel Thickness: 0.0296 inch.
2. Depth: As indicated on Drawings.

I. Resilient Furring Channels: 1/2-inch-deep, steel sheet furring members designed to reduce sound transmission.

1. Minimum Base-Steel Thickness: 0.022 inch.
2. Configuration: Asymmetrical.

J. Cold-Rolled Furring Channels: 0.053-inch base-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 base-steel thickness of 0.0296 inch.
3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A641/A641M, 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. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, AC193, AC58, or AC308 as appropriate for the substrate.

a. Uses: Securing hangers to structure.
b. Type: Torque-controlled, expansion anchor; torque-controlled, adhesive anchor; or adhesive anchor.
c. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
d. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch unless otherwise 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 base-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
2. Steel Studs and Tracks: Refer to “Framing Systems” Article in this Section.
3. High-Strength Steel Studs and Tracks: Refer to “Framing Systems” Article in this Section.
4. Hat-Shaped, Rigid Furring Channels: 7/8 inch deep.

a. Minimum Base-Steel Thickness: 0.0296 inch.

5. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical.

2.4 GRID SUSPENSION SYSTEMS

A. Grid Suspension Systems for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Armstrong World Industries, Inc.
b. CertainTeed; SAINT-GOBAIN.
c. Rockfon; ROCKWOOL International.
d. USG Corporation.

2.5 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.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 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, door stops, 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-structural steel framing members. Frame both sides of joints independently.

## 3.4 INSTALLATION OF FRAMING SYSTEMS

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: 16 inches o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches o.c. 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. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:

1. Screw to 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. Installation Tolerances:

1. 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 INSTALLATION OF GRID SUSPENSION SYSTEMS

A. Grid Suspension Systems: Install in accordance with manufacturer's written instructions. 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.

3.6 FIELD QUALITY CONTROL

A. 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**

## SECTION 09 2900 - GYPSUM BOARD

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

B. Related Requirements:

1. Section 06 1643 "Exterior Gypsum Sheathing" for gypsum sheathing for exterior walls and soffits.
2. Section 09 2216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each product.

B. Samples for Initial Selection: For each type of trim accessory indicated.

C. Samples for Verification: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.3 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.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 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. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

### 2.2 GYPSUM BOARD, GENERAL

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. CertainTeed; SAINT-GOBAIN.
2. Georgia-Pacific Gypsum LLC.
3. National Gypsum Company.
4. USG Corporation.

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 Board, Type X: ASTM C1396/C1396M.

1. Locations: Use in all locations unless otherwise indicated.
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.
4. Weight: Not less than 2.2 pounds per square foot.

B. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M gypsum board, tested in accordance with ASTM C1629/C1629M.

1. Location: As indicated on Drawings.
2. Core: 5/8 inch, Type X.
3. ASTM C1629 Minimum Values (note, higher numbers indicate higher performance):

   a. Surface Abrasion: Level 2.
   b. Surface Indentation: Level 1.
   c. Single-Drop Soft-Body Impact: Level 1.

4. Long Edges: Tapered.
5. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

C. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.

1. Locations: As indicated on Drawings.
2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

### 2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C1396/C1396M. Manufactured to have increased fire-resistive capability.

1. Locations: Provide where required by fire-rated assembly design designations.
2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
3. Long Edges: Tapered.

## 2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:

a. Cornerbead.
b. J-Bead: J-shaped; exposed short flange does not receive joint compound.
c. LC- / U-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. Expansion (control) joint.

## 2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

B. Joint Tape:

1. Interior Gypsum Board: As recommended by panel manufacturer.
2. Glass-Mat Interior Gypsum Board: 10-by-10 glass mesh.
3. 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 drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

D. Joint Compound for Mold-Resistant Gypsum Board: Formulations designed to resist the growth of mold and acceptable to the panel manufacturers. Mold resistance shall comply with at least one of the following:

1. ASTM G21, score of 0.
2. ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

## 2.7 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less.

C. Screws for Steel Framing: Steel drill screws, ASTM C1002 unless otherwise indicated or recommended by panel manufacturer.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed; SAINT-GOBAIN.
b. Johns Manville Corporation.
c. Knauf Insulation.
d. Owens Corning.

2. Formaldehyde Content: Zero.
3. Thickness: Sufficient thickness to fill stud cavity depth unless otherwise indicated.

**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 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

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. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

## 3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

A. 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 vertically (parallel 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. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. 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.

C. 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.

## 3.4 INSTALLATION OF TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim in accordance with manufacturer's written instructions.

B. Control Joints: Verify locations with Architect prior to installation. Install control joints at locations in accordance with all of the following conditions while maintaining fire-resistance rating of gypsum assemblies where indicated:

1. At locations indicated on Drawings.
2. In accordance with ASTM C840.
3. 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. J-Bead: Use where indicated.
3. LC- / U-Bead: Use at exposed panel edges unless otherwise indicated.
4. L-Bead: Use where indicated.

## 3.5 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 in accordance with ASTM C840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: At panel surfaces that will be exposed to view or covered by wall coverings unless otherwise indicated.
3. Level 5:

a. Exposed glass-mat faced gypsum board.
b. Curved partitions.
c. Surfaces scheduled to receive paint finish with a sheen of Gloss Level 5 or higher.
d. Surfaces scheduled to receive applied graphic films.
e. Where indicated on Drawings.

## 3.6 INSTALLATION TOLERANCES

A. Tolerances: Following are the acceptable tolerances for gypsum board work. Work not meeting these tolerances will be considered defective.

1. Maximum Variation From True Position: 1/4 inch.
2. Maximum Variation of any Member from Plane: 1/4 inch.
3. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.
4. Maximum Joint Camber (concave or convex): 1/16 inch.

## 3.7 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**

## SECTION 09 5113 - ACOUSTICAL PANEL CEILINGS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical panels.

2. Metal suspension system.

3. Metal edge moldings and trim.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: Set of 6-inch-square Samples of each type, color, pattern, and texture.

1.4 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. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.

5. Size and location of initial access modules for acoustical panels.

6. 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.

7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.

8. Minimum Drawing Scale: 1/4 inch = 1 foot.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 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 panels equal to 2 percent of quantity installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, 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 panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical panel 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 panel ceiling installation.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS –ACT ##

A. Basis-of-Design Products: Provide indicated products or, subject to compliance with requirements, comparable products from one of the following manufacturers:

1. Armstrong World Industries, Inc.

2. CertainTeed; SAINT-GOBAIN.

3. Rockfon; ROCKWOOL International.

4. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Source Limitations for Ceiling System: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Class A in accordance with ASTM E1264.

2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS ACT-1, ACT-2

A. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

B. ACT-1:

1. Basis-of-Design Product: Refer to Room Finish Material Key on Drawings.

C. ACT-2:

1. Basis-of-Design Product: Refer to Room Finish Material Key on Drawings.

D. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.

E. Food Preparation Areas: Provide panels recommended in writing by panel manufacturers for food preparation areas and that are non-perforated and washable, complying with USDA/FSIS guidelines.

2.4 METAL SUSPENSION SYSTEM

A. Metal Suspension-System: Paint and reuse existing ceiling grid. Refer to Section 09 9123 “Interior Painting” for paint system.

**PART 3 - EXECUTION**

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels based on existing grid.

B. Layout openings for penetrations centered on the penetrating items.

## 3.3 INSTALLATION OF ACOUSTICAL PANEL CEILINGS

A. Install acoustical panel ceilings in accordance with ASTM C636/C636M and manufacturer's written instructions, and CISCA's "Ceiling Systems Handbook".

B. 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.

C. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.

1. Arrange directionally patterned acoustical panels as follows:

   a. As recommended by manufacturer unless otherwise indicated on Drawings.

2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

## 3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.

B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION**

## SECTION 09 6513 - RESILIENT BASE AND ACCESSORIES

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient molding accessories.
3. Metal edge strips.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For resilient molding accessories.

C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 6 inches long.

D. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.3 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. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 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 (10 deg C) or more than 90 deg F (32 deg C).

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time 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 (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Department of Justice's "2010 ADA Standards" and ICC A117.1 for products of this Section.

### 2.2 THERMOPLASTIC-RUBBER BASE – **RB XX**

A. Basis-of-Design Product: Refer to Room Finish Material Key on Drawings. Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. Burke Mercer Flooring Products; a division of Burke Industries Inc.
3. Flexco.
4. Johnsonite; a Tarkett company.
5. Mannington Commercial.
6. Nora Systems, Inc.
7. Roppe Corporation, USA.
8. VPI Corporation.

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location: Provide the following unless otherwise indicated.

a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in non-carpeted areas.
c. Style D, Sculptured: Provide in areas indicated.

1) Profile: As indicated.

C. Thickness: 0.125 inch (3.2 mm).

D. Height: 4 inches (102 mm) unless otherwise indicated.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Colors: Refer to Room Finish Material Key on Drawings.

### 2.3 RESILIENT MOLDING ACCESSORY – **TS XX**

A. General: Resilient transition and reducer strips.

1. Basis-of-Design Manufacturer: Refer to Room Finish Material Key on Drawings. Subject to compliance with requirements, provide products of indicated manufacturer or comparable product acceptable to the Architect.

2. Profile and Dimensions: Manufacturer's standard as required to provide a nominally flush transition.
3. Locations: Provide resilient molding transitions in areas indicated and at all doorways and dissimilar flooring materials where other transition materials are not indicated.
4. Colors and Patterns: As indicated in Room Finish Material Key on Drawings.

B. Transition Strip – **TR XX**:

1. Basis-of-Design Product: Refer to Room Finish Material Key on Drawings.

2.4 METAL EDGE STRIPS

A. Metal Edge Strips: Angle or L-shaped, height to match flooring thickness, metallic, designed specifically for flooring applications; exposed-edge material. Provide in maximum available lengths to minimize running joints.

1. Basis-of-Design Manufacturer: Schluter. Subject to compliance with requirements, provide products of indicated manufacturer or comparable product acceptable to the Architect.
2. Profile and Dimensions: Manufacturer's standard as required to provide a nominally flush transition.
3. Locations: Provide where indicated.
4. Material and Finish: Extruded aluminum with mill finish unless indicated otherwise.

5. Carpet to Resilient Flooring Transition:

a. Basis-of-Design Product: Ceramic Tool Company, "Carpet Trim, CTC-14-CT".
b. Finish: As selected by Architect from manufacturer's full range of anodized finishes.

6. Carpet to Sealed Concrete Transition:

a. Basis-of-Design Product: Schluter, "RENO RAMP, 3/8-inch high".
b. Finish: Satin anodized.

7. Resilient Flooring to Sealed Concrete Transition:

a. Basis-of-Design Product: Ceramic Tool Company, "CTC 2-inch Reducer".
b. Finish: As selected by Architect from manufacturer's full range of anodized finishes.

2.5 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.

1. Adhesives shall have a VOC content of 50 g/L or less.

**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. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the 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.

D. 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.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. 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. Where splices cannot be avoided, ends shall be tight and flush.

3.5 METAL EDGE STRIP INSTALLATION

A. Comply with manufacturer's written instructions for installing metal edge strips.

B. Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Neatly miter corners.

3.6 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 exposed surfaces.

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**

## SECTION 09 6519 - RESILIENT TILE FLOORING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid (“Luxury”) vinyl floor tile.

B. Related Requirements:

1. Section 09 0563 "Flooring Substrate Acceptance Statement".
2. Section 09 6513 “Resilient Base and Accessories” for resilient tile at stair landings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Compatibility Certification: Certifications from adhesive and flooring manufacturers that products are compatible with flooring, concrete curing compounds, and other project-specific substrate conditions.

C. Substrate Acceptance Statement: Refer to Part 3 of this Section.

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 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 10 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1.7 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.

1.8 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 time 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 tile flooring, as determined by testing identical products according to ASTM E648 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 TILE

A. Basis-of-Design Product: Refer to Room Finish Material Key on Drawings.

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 floor tile manufacturer for applications indicated.

1. Compressive Strength: 3500 psi minimum.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

**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 F710.

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. Testing: Test substrates as recommended by adhesive and flooring manufacturers. Tests shall include not less than the following:

a. Test Frequency: Perform tests so that each test area does not exceed 300 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
b. Alkalinity and Adhesion Testing: Perform tests recommended by resilient tile flooring 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.
c. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient tile flooring manufacturer's written recommendations, but not less stringent than the following:

1) Perform anhydrous calcium chloride test according to ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
2) Perform relative humidity test using in situ probes according to ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

d. Submit Flooring Substrate Acceptance Statement located in Section 09 0563 prior to beginning of installation.
e. If substrate fails testing, notify Architect immediately in writing and withhold flooring installation until provided direction by Architect.
f. Beginning of installation indicates Installer acceptance of substrate conditions.

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. Floor Marking: Use chalk or chalk lines covered with clear acrylic spray; do not use floor marking paints, markers, or other marking methods that are incompatible with flooring material and allow markings to show through installed flooring material.

1. If substrate has floor marking paints, markers, or other marking methods incompatible with flooring and that may allow markings to show through installed flooring material, remove markings using mechanical methods recommended by flooring manufacturer.
2. Do not install flooring until incompatible floor markings on substrate have been removed and substrate is acceptable to flooring manufacturer for installation of flooring materials.

E. Do not install floor tiles until they are the same temperature as the 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. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in pattern of colors and sizes indicated.

D. 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.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. 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.

G. Adhere floor tiles to flooring 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 exposed 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**

## SECTION 09 9113 - EXTERIOR PAINTING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes paint systems on exterior substrates.

B. Related Requirements:

1. Division 05 for shop priming metal substrates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Label sample with date of application; samples shall be a minimum of seven-days old.
2. Submit Samples on rigid backing, 8 inches (200 mm) square.
3. Apply coats on Samples in steps to show each coat required for system.
4. Label each coat of each Sample.
5. Label each Sample for location and application area.

D. Product Schedule: Use same designations indicated on Drawings and in the Exterior Painting Schedule to cross-reference paint systems specified in this Section. Include color designations.

1.3 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. Paint Products: 5 percent, but not less than 1 gal. (3.8 L) of each material, color, and sheen applied.

2. Paint: Equal to 2 percent, but not less than 1 quart of each material, color, and sheen applied.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Benjamin Moore & Co. (Moore)
2. Hallman Lindsay Paints (Hallman)
3. PPG Paints (PPG)
4. Sherwin-Williams Company (The). (SW)

B. Source Limitations: Obtain each paint product from single source from single manufacturer.

C. Product Schedule: Refer to product schedule at end of Section.

2.2 PAINT PRODUCTS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are 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, provide products recommended in writing by topcoat manufacturer for use in paint system and on substrate indicated.

B. Colors: Match Architect's samples.

**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: Measure substrates with an electronic moisture meter to verify substrates comply with manufacturers' recommendations.

C. Verify suitability of substrates, including surface conditions and compatibility, with 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. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems specified in this Section.

C. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and remove sanding dust.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

## 3.3 INSTALLATION

A. Apply paints in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint exterior side and edges of exterior doors and entire exposed surface of exterior door frames.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. 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 FIELD QUALITY CONTROL

A. General: Completed Work shall match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

B. Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent. This includes, but is not limited to, the following:

1. Brush/roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
3. Damage due to touching before paint is sufficiently dry or any other contributory cause.
4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.
5. Damage and/or contamination of paint due to wind-blown contaminants (dust, sand blast materials, salt spray, etc.).

C. Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source or permanent artificial lighting source for exterior surfaces. This includes, but is not limited to, the following:

1. Visible defects evident on vertical surfaces when viewed at 90 degrees to the surface from a distance of 39 inches.
2. Visible defects evident on horizontal surfaces when viewed at 45 degrees to the surface from a distance of 39 inches.
3. Visible defects evident on soffit and other overhead surfaces when viewed at 45 degrees to the surface.
4. When the final coat on any surface exhibits a lack of uniformity of sheen across full surface area.

D. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

E. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written instructions.

## 3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. 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.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

## 3.6 EXTERIOR PAINTING SCHEDULE

A. Wood Substrates: Wood trim.

1. Semi-Gloss, Acrylic-Enamel Finish:

a. Prime Coat: Exterior, alkali-resistant, acrylic-latex based primer.

1) Moore: Fresh Start High Hiding All Purpose Primer N046.
2) Hallman: Prime Guard 112 Acrylic Primer.
3) PPG: Seal Grip Int/Ext Acrylic Universal Primer/Sealer 17-921xi.
4) SW Exterior Latex Wood Primer B42W08041.

b. First and Second Coats: Exterior, latex, semi-gloss.

1) Moore: Ultra Spec Ext Gloss Finish N449.
2) Hallman: Weather Guard 172 Satin Acrylic House Paint.

3) PPG: Speedhide Exterior 100% Acrylic Latex Semi-Gloss 6-900xi Series.
4) SW A-100 Exterior Latex Gloss Paint A8 Series.

**END OF SECTION**

## SECTION 09 9123 - INTERIOR PAINTING

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes paint systems on interior substrates.

B. Related Requirements:

1. Division 05 for shop priming metal substrates.
2. Section 09 9113 “Exterior Painting” for painting of exterior substrates, underground parking, and non-conditioned spaces.

1.2 DEFINITIONS

A. General: Standard coating terms defined in ASTM D16 apply to this Section.

B. Sheen: As defined by the Master Painters Institute (MPI). Wherever reference is made to sheen finish or gloss, provide reflectivity, when measured with a gloss meter per ASTM D523, as follows for each designation:

1. Gloss Level 1: Flat: Not more than five units at 60 degrees and 10 units at 85 degrees.
2. Gloss Level 3: Eggshell: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
3. Gloss Level 4: Satin: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees.
4. Gloss Level 5: Semi-Gloss: 35 to 70 units at 60 degrees.
5. Gloss Level 6: Full Gloss: 70 to 85 units at 60 degrees.
6. Gloss Level 7: High Gloss: More than 85 units at 60 degrees.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Label sample with date of application; samples shall be a minimum of seven-days old.
2. Submit Samples on rigid backing, 8 inches (200 mm) square.
3. Apply coats on Samples in steps to show each coat required for system.
4. Label each coat of each Sample.
5. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 CLOSEOUT SUBMITTALS

A. Supplied Coatings Maintenance Manual:

1. Furnish a coating maintenance manual, such as Sherwin-Williams “Custodian Project Color and Product Information” report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

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. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material, color, and sheen applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Simulate finished lighting conditions for review of mockups.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co. (Moore)
2. Hallman Lindsay Paints (Hallman)
3. PPG Paints (PPG)
4. Sherwin-Williams Company (The). (SW)

B. Source Limitations: Obtain each paint product from single source from single manufacturer.

C. Product Schedule: Refer to product schedule at end of Section.

### 2.2 PAINT, GENERAL

A. 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.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Clear wood finishes: varnishes and sealers: 350 g/L.
10. Stains: 250 g/L.

C. Colors: Refer to Room Finish Material Key on Drawings.

## 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: Measure substrates with an electronic moisture meter to verify substrates comply with manufacturers' recommendations.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Paintable sealants shall be installed and cured prior to painting.

E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

F. 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 if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 3, "Power Tool Cleaning."

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

1. Hollow Metal Doors and Frames: Apply primer specified in this Section over factory-/shop-applied primers.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

1. Test for passivators. If present, consult paint manufacturer and prepare surfaces as directed by manufacturer.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.

4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

## 3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Provide tinted primer when recommended by system manufacturer.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. 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.

E. Stain: Adjust stain application technique as required to match and/or blend different work pieces. Utilize fillers on end-grain as required.

F. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

## 3.4 FIELD QUALITY CONTROL

A. General: Completed Work shall match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

B. Painted surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent. This includes, but is not limited to, the following:

1. Brush/roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
2. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
3. Damage due to touching before paint is sufficiently dry or any other contributory cause.
4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.
5. Damage and/or contamination of paint due to wind-blown contaminants (dust, sand blast materials, salt spray, etc.).

C. Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source or permanent artificial lighting source. This includes, but is not limited to, the following:

1. Visible defects evident on vertical surfaces when viewed at 90 degrees to the surface from a distance of 39 inches.
2. Visible defects evident on horizontal surfaces when viewed at 45 degrees to the surface from a distance of 39 inches.
3. Visible defects evident on soffit and other overhead surfaces when viewed at 45 degrees to the surface.
4. When the final coat on any surface exhibits a lack of uniformity of sheen across full surface area.

D. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

E. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

## 3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. 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.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

## 3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Eggshell, Latex System:

a. Prime Coat: Primer, alkali-resistant, water-based.

1) Moore: Ultra Spec Int/Ext Acrylic High Build Prime Masonry Primer 609 (48 g/L).
2) Hallman: Gripcrete Acrylic Masonry-Plaster Primer 166 High pH Primer (51 g/L).
3) PPG: Perma-Crete Interior/Exterior Alkali Resistant Primer 4-603XI (<100 g/L).
4) SW: Loxon Concrete & Masonry Primer LX02 (<50 g/L).

b. First and Second Coats: Latex, interior, low-luster (eggshell or satin).

1) Moore: Ultra Spec 500 Interior Zero VOC Eggshell Enamel T538 (0 g/L).
2) Hallman: Prokote Zero VOC 284 Latex Eggshell (0 g/L).
3) PPG: Speedhide Zero VOC Eggshell Int. Latex 6-4310XI Series (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Eg-Shel B20-2600 Series (<50 g/L).

2. Semi-Gloss, Latex System:

a. Prime Coat: Primer, alkali-resistant, water-based.

1) Moore: Ultra Spec Int/Ext Acrylic High Build Prime Masonry Primer 609 (48 g/L).
2) Hallman: Gripcrete Acrylic Masonry-Plaster Primer 166 High pH Primer (51 g/L).
3) PPG: Perma-Crete Interior/Exterior Alkali Resistant Primer 4-603XI (<100 g/L).
4) SW: Loxon Concrete & Masonry Primer LX02 (<50 g/L).

b. First and Second Coats: Latex, interior, semi-gloss.

1) Moore: Ultra Spec 500 Interior Zero VOC Semi-Gloss Finish T546 (0 g/L).
2) Hallman: Prokote Zero VOC 296 Interior Latex Semi Gloss Enamel (0 g/L).
3) PPG: Speedhide Zero VOC Semi-Gloss Interior Latex 6-4510XI Series (0 g/L).
4) SW: ProMar 200 Zero VOC Interior Latex Semi-Gloss B31-2600 Series (<50 g/L).

3. Semi-Gloss, Pre-Catalyzed Acrylic Epoxy Coating System: Finished surface shall be pinhole free.

a. Prime Coat: Primer, alkali-resistant, water-based.

1) Moore: Ultra Spec Int/Ext Acrylic High Build Prime Masonry Primer 609 (48 g/L).
2) Hallman: Gripcrete Acrylic Masonry-Plaster Primer 166 High pH Primer (51 g/L).
3) PPG: Perma-Crete Alkali Resistant Primer 4-603XI Series (<100 g/L).
4) SW: Loxon Acrylic Masonry Primer LX02 (<50 g/L).

b. First and Second Finish Coats: Single component acrylic epoxy coating.

1) Moore: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L).
2) Hallman: Aquapoxy 515 Semi Gloss Pre-Catalyzed Epoxy (81 g/L).
3) PPG: Pitt Glaze WB1 Pre-Catalyzed Water borne Semi Gloss Epoxy 16-510 Series (<100 g/L).

B. CMU Substrates:

1. Flat, Latex System:

a. Block Filler: Block filler, latex, interior.

1) Moore: Benjamin Moore Block Filler 244 (35 g/L).
2) Hallman: Gripcrete 184 Acrylic Blockfiller (2.6 g/L).
3) PPG: Speedhide Int/Ext Masonry Latex Block Filler 6-7 (<50 g/L).

4) SW: PrepRite Int/Ext Block Filler B25W25 (<50 g/L).

b. First and Second Coats: Latex, interior, flat.

1) Moore: Ultra Spec 500 Interior Zero VOC Flat Finish T535 (0 g/L).
2) Hallman: Prokote Zero VOC 264 Latex Flat (0 g/L).
3) PPG: Speedhide Zero VOC Flat Interior Latex 6-4110XI Series (0 g/L).
4) SW: ProMar 200 Zero VOC Interior Latex Flat B30-2600 Series (<50 g/L).

2. Eggshell, Latex System:

a. Block Filler: Block filler, latex, interior.

1) Moore: Benjamin Moore Block Filler 244 (35 g/L).
2) Hallman: Gripcrete 184 Acrylic Blockfiller (2.6 g/L).
3) PPG: Speedhide Int/Ext Masonry Latex Block Filler 6-7 (<50 g/L).
4) SW: PrepRite Int/Ext Block Filler B25W25 (<50 g/L).

b. First and Second Coats: Latex, interior, low-luster (eggshell or satin).

1) Moore: Ultra Spec 500 Interior Zero VOC Eggshell Finish T538 (0 g/L).
2) Hallman: Prokote Zero VOC 284 Latex Eggshell (0 g/L).
3) PPG: Speedhide Zero VOC Eggshell Int. Latex 6-4310XI Series (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Eg-Shel B20-2600 Series (<50 g/L).

3. Semi-Gloss, Latex System:

a. Block Filler: Block filler, latex, interior.

1) Moore: Benjamin Moore Block Filler 244 (35 g/L).
2) Hallman: Gripcrete 184 Acrylic Blockfiller (2.6 g/L).
3) PPG: Speedhide Int/Ext Masonry Latex Block Filler 6-7 (<50 g/L).
4) SW: PrepRite Int/Ext Block Filler B25W25 (<50 g/L).

b. First and Second Coats: Latex, interior, semi-gloss.

1) Moore: Ultra Spec 500 Interior Zero VOC Semi-Gloss Finish T546 (0 g/L).
2) Hallman: Prokote Zero VOC 296 Interior Latex Semi Gloss Enamel (0 g/L).
3) PPG: Speedhide Zero VOC Semi-Gloss Interior Latex 6-4510XI Series (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Semi-Gloss B31-2600 Series (<50 g/L).

4. Semi-Gloss, Pre-Catalyzed Acrylic Epoxy Coating System:

a. Block Filler: Block filler, latex, interior.

1) Moore: Benjamin Moore Block Filler 244 (35 g/L).
2) Hallman: Gripcrete Heavy Duty Block Filler 181 (39 g/L).
3) PPG: Speedhide Hi Fill Latex Block Filler 6-15XI (<50 g/L).
4) SW: Pro Industrial Heavy Duty Block Filler, B42W150 (<50 g/L).

b. First and Second Finish Coats: Single component acrylic epoxy coating.

1) Moore: Corotech Pre-Catalyzed Waterborne Epoxy V341 Semi-Gloss (71 g/L).
2) Hallman: Aquapoxy 515 Semi Gloss Pre-Catalyzed Epoxy (81 g/L).
3) PPG: Pitt Glaze WB1 Pre Catalyzed Water borne Semi Gloss Epoxy 16-510 Series (<100 g/L).

C. Steel Substrates, Including Galvanized Metals:

1. Flat, Latex System:

a. Prime Coat: Primer, rust-inhibitive, water based.

1) Moore: Ultra Spec HP Acrylic Metal Primer HP04 (48 g/l).
2) Hallman: Metal Guard DTM Acrylic Primer 338 (165 g/L).
3) PPG: Pitt-Tech Plus 4020 PF Series (91 g/L).
4) SW: Pro-Cryl Universal Primer B66-1310 Series (<50 g/L).

b. First and Second Coats: Latex, interior, flat.

1) Moore: Ultra Spec 500 Interior Zero VOC Flat Finish T535 (0 g/L).
2) Hallman: Prokote Zero VOC 264 Latex Flat (0 g/L).
3) PPG: Speedhide Zero VOC Flat Interior Latex 6-4110XI Series (0 g/L).
4) SW: ProMar 200 Zero VOC Interior Latex Flat B30-2600 Series (<50 g/L).

2. Eggshell, Latex System:

a. Prime Coat: Primer, rust-inhibitive, water based.

1) Moore: Ultra Spec HP Acrylic Metal Primer HP04 (48 g/l).
2) Hallman: Metal Guard DTM Acrylic Primer 338 (165 g/L).
3) PPG: Pitt-Tech Plus 4020 PF Series (91 g/L).
4) SW: Pro-Cryl Universal Primer B66-1310 Series (<50 g/L).

b. First and Second Coats: Latex, interior, low-luster.

1) Moore: Ultra Spec 500 Interior Zero VOC Eggshell Finish T538 (0 g/L).
2) Hallman: Prokote Zero VOC 284 Latex Eggshell (0 g/L).
3) PPG: Speedhide Zero VOC Eggshell Int. Latex 6-4310XI Series (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Eg-Shel B20-2600 Series (<50 g/L).

3. Semi-Gloss, Latex System:

a. Prime Coat: Primer, rust-inhibitive, water based.

1) Moore: Ultra Spec HP Acrylic Metal Primer HP04 (48 g/l).
2) Hallman: Metal Guard DTM Acrylic Primer 338 (165 g/L).
3) PPG: Pitt-Tech Plus 4020 PF Series (91 g/L).
4) SW: Pro-Cryl Universal Primer B66-1310 Series (<50 g/L).

b. First and Second Coats: Latex, interior, semi-gloss.

1) Moore: Ultra Spec 500 Interior Zero VOC Semi-Gloss T546 (0 g/L).
2) Hallman: Ultima 100% Acrylic Zero-VOC Enamel 518 (0 g/L).
3) PPG: Pitt Tech Plus 4216 HP Series (91 g/L).
4) SW: Pro Industrial Acrylic Semi-Gloss B66-650 Series (<50 g/L).

4. Semi-Gloss, Pre-Catalyzed Acrylic Epoxy Coating System:

a. Prime Coat: Primer, rust-inhibitive, water based.

1) Moore: Ultra Spec HP Acrylic Metal Primer HP04 (48 g/l).
2) Hallman: Metal Guard DTM Acrylic Primer 338 (165 g/L).
3) PPG: Pitt-Tech Plus 4020 PF Series (91 g/L).
4) SW: Pro-Cryl Universal Primer B66-1310 Series (<50 g/L).

b. First and Second Finish Coats: Single component acrylic epoxy coating.

1) Moore: Corotech Pre-Catalyzed Waterborne Epoxy V341 Semi-Gloss (71 g/L).
2) Hallman: Aquapoxy 515 Semi Gloss Pre-Catalyzed Epoxy (81 g/L).
3) PPG: Pitt Glaze WB1 Pre-Catalyzed Water-Borne Semi-Gloss Epoxy 16-510 Series (<100 g/L).

D. Painted Wood Substrates: Wood trim.

1. Semi-Gloss, Alkyd System:

a. Prime Coat: Primer, latex, for interior wood.

1) Moore: Advance Waterborne Interior Alkyd Primer 790 (44 g/L).
2) Hallman: Aqua Kote Acrylic Undercoater 231 (30 g/L).
3) PPG: Seal Grip Int/Ext Acrylic Universal Primer/Sealer 17-921XI (<50 g/L).
4) SW: Premium Wall & Wood Primer Interior Latex Primer B28W08111 (<50 g/L).

b. First and Second Coats: Waterborne alkyd, interior, semi-gloss.

1) Moore: Advance Waterborne Interior Alkyd Semi-Gloss 793 (48 g/L).
2) Hallman: Aqua Alkyd Zero VOC WB Semi-Gloss 293 (0 g/L).
3) PPG: Speedhide Interior/Exterior WB Alkyd Semi-Gloss 6-1510 (37 g/L).
4) SW: ProMar 200 Zero Waterbased Acrylic-Alkyd Semi-Gloss B34-8200 Series (70 g/L).

E. Gypsum Board and Plaster Substrates:

1. Flat, Latex System:

a. Prime Coat: Primer sealer, latex, interior.

1) Moore: Ultra Spec 500 Interior Zero VOC Latex Primer N534 (0 g/L).
2) Hallman: Builder's Legacy Pro Wall Primer 227 (4 g/L).
3) PPG: Speedhide Zero VOC Interior Latex Primer 6-4900XI (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Primer B28W2600 (<50 g/L).

b. First and Second Coats: Latex, interior, flat.

1) Moore: Ultra Spec 500 Interior Zero VOC Flat Finish T535 (0 g/L).
2) Hallman: Prokote Zero VOC 264 Interior Latex Flat (4 g/L).
3) PPG: Speedhide Zero VOC Flat Interior Latex 6-4110XI Series (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Flat B30-2600 Series (<50 g/L).

2. Semi-Gloss, Latex System:

a. Prime Coat: Primer sealer, latex, interior.

1) Moore: Ultra Spec 500 Interior Zero VOC Latex Primer N534 (0 g/L).
2) Hallman: Builder's Legacy Pro Wall Primer 227 (4 g/L).
3) PPG: Speedhide Zero VOC Interior Latex Primer 6-4900XI (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Primer B28W2600 (<50 g/L).

b. First and Second Coats: Latex, interior, semi-gloss.

1) Moore: Ultra Spec 500 Interior Zero VOC Semi-Gloss Finish T546 (0 g/L).
2) Hallman: Prokote Zero VOC 296 Interior Latex Semi Gloss Enamel (4 g/L).

3) PPG: Speedhide Zero VOC Semi-Gloss Interior Latex 6-4510XI Series (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Semi-Gloss B31-2600 Series (<50 g/L).

3. Eggshell, Abrasion-Resistant Latex System:

a. Prime Coat: Primer sealer, latex, interior.

1) Moore: Ultra Spec 500 Interior Zero VOC Latex Primer N534 (0 g/L).
2) Hallman: Builder's Legacy Pro Wall Primer 227 (4 g/L).
3) PPG: Speedhide Zero VOC Interior Latex Primer 6-4900XI (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Primer B28W2600 (<50 g/L).

b. First and Second Coats: Acrylic-latex, single-component, interior abrasion-resistant finish, low-luster.

1) Moore: Ultra Spec Scuff-X Interior Eggshell Finish 485 (89 g/L).
2) Hallman: Prokote HP Interior Eggshell Enamel 284HP (0 g/L).
3) PPG: Pitt Glaze WB1 Pre-Catalyzed Water-Borne Epoxy Eggshell 16-310 Series (<100 g/L)].
4) SW: ProMar 200 HP Zero VOC Interior Acrylic Eggshell B20-1900 Series (<50 g/L).

4. Semi-Gloss /Eggshell, Pre-Catalyzed Acrylic Epoxy Coating System:

a. Prime Coat: Primer sealer, latex, interior.

1) Moore: Ultra Spec 500 Interior Zero VOC Latex Primer N534 (0 g/L).
2) Hallman: Builder's Legacy Pro Wall Primer 227 (4 g/L).
3) PPG: Speedhide Zero VOC Interior Latex Primer 6-4900XI (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Primer B28W2600 (<50 g/L).

b. First and Second Finish Coats: Single component acrylic epoxy coating.

1) Moore: Corotech Pre-Catalyzed Waterborne Epoxy V341 Semi-Gloss (71 g/L) V342 Eggshell (73 g/L).
2) Hallman: Aquapoxy 515 Semi Gloss Pre-Catalyzed Epoxy (81 g/L) 514 Eggshell Pre-Catalyzed Epoxy (67 g/L).
3) PPG: Pitt Glaze WB1 Pre Catalyzed Water borne Epoxy Semi-Gloss 16-510 Series (<100 g/L) Eggshell 16-310 Series (<100 g/L).
4) SW: Pro Industrial Pre-Catalyzed Waterbased Epoxy Semi-Gloss K46-150 (<50 g/L) Eggshell K45-150 (<50 g/L).

5. Eggshell/Semi-Gloss, Acrylic Catalyzed Epoxy Coating System:

a. Prime Coat: Primer sealer, latex, interior.

1) Moore: Fresh Start High Hiding All Purpose Primer 046 (44 g/L).
2) Hallman: Aqua Kote Acrylic Undercoater 231 (30 g/L).
3) PPG: Seal Grip Int/Ext Acrylic Universal Primer/Sealer 17-921XI (<50 g/L).
4) SW: ProMar 200 Zero Interior Latex Primer B28W2600 (<50 g/L).

b. First and Second Finish Coats: High performance acrylic epoxy coating.

1) Moore: Corotech Waterbased Catalyzed Acrylic Epoxy V450 Semi-Gloss (190 g/L).
2) Hallman: International Tru-Glaze 4426 Semi Gloss WB Epoxy (44 g/L).
3) PPG: Aquapon WB EP Semi-Gloss Epoxy 98E-1 Series (26 g/L).
4) SW: Pro Industrial Waterbased Catalyzed Epoxy Eggshell B73-300 Series (<50 g/L).

F. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings.

1. Flat, Latex System: Two finish coats. Add fungicidal agent to render fabric mildew proof.

a. First and Second Coats: Latex, interior, flat.

1) Moore: Ultra Spec 500 Interior Zero VOC Flat Finish T535 (0 g/L).
2) Hallman: Prokote Zero VOC 264 Latex Flat (4 g/L).
3) PPG: Speedhide Zero VOC Flat Interior Latex 6-4110XI Series (0 g/L).
4) SW: ProMar 200 Zero Interior Latex Flat B30-2600 Series (<50 g/L).

G. Existing Ceiling Grid.

1. Eggshell, Acrylic System: Two finish coats.

a. Primer:

1) SW: S-W Extreme Bond Interior/Exterior Bonding Primer, B52W1150 Series.

b. Finish Coat: Latex, interior, flat.

1) SW: S-W Pro Industrial Multi-Surface Acrylic Eg-Shel B66-1560 Series.

**END OF SECTION**

## SECTION 10 4413 - FIRE PROTECTION CABINETS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguishers.

B. Related Requirements:

1. Section 10 4416 "Fire Extinguishers".

1.2 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers specified elsewhere are accommodated.

B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

C. Where cabinets are recessed in fire-rated construction, provide fire-rated cabinets.

1.3 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. Shop Drawings: For fire-protection cabinets.

1. Include plans, elevations, sections, details, and attachments to other work.

C. Product Schedule: For fire-protection cabinets. Indicate mounting type. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

## PART 2 - PRODUCTS

2.1 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.

2.2 FIRE-PROTECTION CABINETS

A. Source Limitations: Obtain fire-protection cabinets from single source from single manufacturer.

B. Cabinet Type: Suitable for fire extinguisher.

1. Basis-of-Design Products: Subject to compliance with requirements, provide indicated products or comparable products by one of the following:

a. JL Industries, Inc.; a division of the Activar Construction Products Group.
b. Larsen's Manufacturing Company.
c. Potter Roemer LLC.

2. Multi-purpose (Type A:B:C) Extinguisher Cabinet Types:

a. Surface Mounted:

1) Basis-of-Design Product: Larsen's; Architectural Series "2409-SM-Vertical Duo".

C. Cabinet Construction:

1. Cabinet Material: Cold-rolled steel sheet.
2. Cabinet Trim Material: Same material and finish as door.

3. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

D. Door Construction:

1. Door Material: Steel sheet.
2. Door Style: Vertical duo panel with frame.
3. Door Glazing: Acrylic sheet.

a. Acrylic Sheet Color: Clear transparent acrylic sheet.

E. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Latch: Provide projecting handle with cam-action or friction latch.
2. Hinge: Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.

F. Accessories:

1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.

a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet door.

2) Application Process: Pressure-sensitive vinyl letters.
3) Lettering Color: As selected by Architect from manufacturer's full range.
4) Orientation: Vertical.

G. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

a. Finish: Baked enamel or powder coat.
b. Color: As selected by Architect from manufacturer's full range.

2. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), 3 mm thick, with Finish 1 (smooth or polished).

2.3 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. Provide factory-drilled mounting holes.

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. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 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. Finish fire-protection cabinets after assembly.

C. 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 walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed and semi-recessed 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 or, if not indicated, at heights indicated below:

1. Fire-Protection Cabinets: 48 inches above finished floor to top of cabinet.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

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 latching and 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 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**

## SECTION 10 4416 - FIRE EXTINGUISHERS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Requirements:

1. Section 10 4413 "Fire Protection Cabinets."

1.2 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets and mounting brackets to ensure fit and function.

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 and mounting brackets.

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 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 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide indicated products or comparable product by one of the following:

1. Amerex Corporation.
2. Ansul; Tyco Fire Protection Products.
3. JL Industries, Inc.; a division of the Activar Construction Products Group.
4. Larsen's Manufacturing Company.
5. Potter Roemer LLC.

B. Source Limitations: Obtain fire extinguishers and accessories from single source from single manufacturer.

### 2.2 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.

### 2.3 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Valves: Manufacturer's standard.
2. Handles and Levers: Manufacturer's standard.
3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Type ABC - Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

1. Basis-of-Design Product: Larsen's, "Model MP10".

### 2.4 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's brackets, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish and retaining straps.

1. Provide mounting brackets for all fire extinguishers not indicated to include a fire extinguisher cabinet.
2. Multi-purpose (Type A:B:C) Bracket Type: Galvanized steel.

a. Basis-of-Design Product: Larsen's, "Model 846".

## 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 and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

1. Mounting Brackets: Top of fire extinguisher to be at 48 inches above finished floor.

**END OF SECTION**

## SECTION 12 3623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad countertops.

B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing countertops and concealed within other construction before countertop installation.
2. Section 06 4116 “Plastic-Laminate-Clad Architectural Cabinets” for plastic laminate products.

1.2 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 countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. 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 of laminate joints.
3. Show locations and sizes of cutouts and holes for items installed in plastic-laminate-clad countertops.
4. Show grain/pattern direction.

C. Samples for Verification:

1. Plastic Laminates: For each type, color, pattern, and surface finish required, 8 by 10 inches (200 by 250 mm) in size.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator and Installer.

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. Engage a firm with not less than 5 years’ experience in producing and installing countertops similar in quantity and complexity to that shown on Drawings and specified herein.

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. 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.

**PART 2 - PRODUCTS**

2.1 PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. Quality Standard: Unless otherwise indicated, comply with AWI Standards current edition (AWI) for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

1. 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. AWI Grade: Premium.

C. High-Pressure Decorative Laminate – **PL#**: ISO 4586-3, Grade HGS; Grade HGP for post-formed products.

1. Basis-of-Design Product: Refer to Room Finish Material Key on Drawings. Subject to compliance with requirements, provide indicated product, or when no product is indicated, provide comparable product by one of the following:

a. Arborite.
b. Formica Corporation.
c. Nevamar
d. Pionite; a Panolam Industries International, Inc. brand.
e. Wilsonart LLC.

D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. Refer to Room Finish Material Key on Drawings.

2. Grain/Pattern Direction: Parallel to long edges of fabrication.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material:

1. Typical: Particleboard or MDF.

G. Core Thickness: 3/4 inch (19 mm).

1. Build up countertop thickness to 1-1/2 inches (38 mm) at front, back, and ends with additional layers of core material laminated to top.

H. Backer Sheet: Provide plastic-laminate backer sheet, ISO 4586-3, Grade BKL, on underside of countertop substrate.

2.2 ACCESSORIES

A. Wire-Management Grommets: Circular, molded-plastic grommets and matching plastic caps with slot for wire passage.
1. Outside Diameter: 1-1/4 inch (32 mm).
2. Color: Black,

2.3 MISCELLANEOUS MATERIALS

A. Adhesives: Do not use adhesives that contain urea formaldehyde.

B. VOC Limits for Installation Adhesives: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.
3. Structural Wood Member Adhesive: 140 g/L.

C. 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.

2.4 FABRICATION

A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets.

1. Plumbing Fixtures: Laminate seams and counter joints shall not occur within 24 inches of a plumbing fixture.
2. Solid-Wood (Lumber) Members: Ease edges to 1/16 inch (1.5 mm) radius unless otherwise indicated.

B. 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.

**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. AWI 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.

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 (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten in accordance with 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. 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-inches (3-mm-in-2400-mm) variation 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 in accordance with Section 07 9200 “Joint Sealants”.

F. Grommets: Install grommets where indicated, or if not indicated, where directed by Owner.

## 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 (1220 mm) o.c. Remove protection at Substantial Completion.

**END OF SECTION**

## SECTION 12 3661.16 - SOLID SURFACING COUNTERTOPS

### PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.

B. Related Requirements:

1. Section 06 1053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing countertops and concealed within other construction before countertop installation.
2. Section 09 2216 "Non-Structural Metal Framing" for blocking, strapping, and hanging strips required for installing countertops and concealed within other construction before countertop installation.

1.2 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 countertops.

B. Coordinate locations of utilities that will penetrate solid surfacing fabrications.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. 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.

C. Samples for Verification: For the following products:

1. Solid surfacing material, 6 inches square for each type and color specified.
2. One full-size solid surface material countertop, with front edge and backsplash, 8 by 10 inches, of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator and Installer.

B. Product Certificates: For each type of product.

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 solid surfacing fabrications similar to that required for this Project, and whose products have a record of successful in-service performance.

1. Engage a firm with not less than 5 years' experience in producing and installing solid surfacing work similar in quantity and complexity to that shown on Drawings and specified herein.

B. Installer Qualifications: Fabricator of solid surfacing fabrications or an experienced installer hired directly by Fabricator with at least 5 years' experience installing solid surfacing fabrications.

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 occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

**PART 2 - PRODUCTS**

2.1 SOLID SURFACE MATERIALS

A. Solid Surface Material – **SS1**: Homogeneous-filled plastic resin complying with ISFA 2-01.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

a. Du Pont de Nemours, Inc. (Corian)
b. Formica Corporation.
c. Hanex; Hyundai L&C USA, LLC.
d. LG Chemical, Ltd.
e. Samsung Chemical USA, Inc.
f. Wilsonart LLC.

2. Type: Provide Standard type unless Special Purpose type is indicated.
3. Colors and Patterns: Refer to Room Finish Material Key on Drawings.

2.2 SUBSTRATE MATERIALS

A. Substrate Material: Particleboard, medium-density fiberboard (MDF), or plywood.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.

B. Sealant for Countertops: Refer to Section 07 9200 "Joint Sealants."

2.4 SOLID SURFACING FABRICATION

A. Fabricate products of this Section according to solid surface material manufacturer's written instructions and to AWI Standards current edition (AWI).

1. AWI Grade: Custom.
2. Polish exposed surfaces.
3. Ease exposed edges.

B. Fabricate tops with shop-applied edges unless 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.

C. Joints: Fabricate countertops without joints to maximum extent possible.

1. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable. No joints shall occur above a dishwasher.

D. 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, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.

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.
3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

**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. AWI Grade: Install countertops to comply with same grade as item to be installed.

B. Counter Support Brackets: Countertops not supported by casework, unless otherwise indicated, shall be supported by brackets. Unsupported spans shall not exceed 48 inches. Unsupported cantilevers shall not exceed 15 inches.

C. 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.

D. Scribe to adjoining surfaces and field trim as required for a tight fit.

E. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

F. 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.

G. 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.

H. 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.

I. 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.

J. 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 subtops by saturating with varnish.

K. Apply sealant to gaps at walls; comply with Section 07 9200 "Joint Sealants."

## 3.3 ADJUSTING AND CLEANING

A. Clean exposed and semiexposed surfaces countertops as recommended by manufacturer.

B. Touch up as required to restore damaged or soiled areas to match original factory finish, as approved by Architect. Replace units that are cracked, chipped, broken, or otherwise defective.

**END OF SECTION**

## SECTION 13 1811 - CURLING RINK GENERAL REQUIREMENTS

### PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality assurance - prequalification criteria.

B. General description of ice system requirements including curling rink floor.

C. Reinspection.

D. Submittal and project closeout requirements.

E. Electrical requirements.

F. General concrete requirements.

G. Start-up and shutdown procedures.

H. Building first ice sheet.

I. Demolition work.

1.2 QUALITY ASSURANCE

A. Contractors wishing to bid/quote on this project must submit, with their bid, the following prequalification criteria.

1. As evidence and assurance of the contractor's concrete subcontractor's ability to construct the project the contractor placing and finishing the concrete must have successfully completed the placement and finishing of concrete on **eight (8) concrete ice rink floor construction projects within the past five (5) years.** Submit information on each project. Submittal shall be on company letterhead, signed by an authorized representative of the company and include project description, portion of project completed by the company, location, construction cost, completion date, owner's name, owner's representative, phone number and completion date of work.

2. As evidence and assurance of the contractor's expansion joint subcontractor's ability to construct the project the ice rink floor expansion joint subcontractor must have successfully completed twenty (20) construction projects that use the same type of joint. Submit information on each project. Submittal shall be on company letterhead, signed by an authorized representative of the company and include project description, portion of project completed by the company, location, construction cost, completion date, owner's name, owner's representative, phone number and completion date of work.

3. Submit the name of at least one (1) person employed by the company that will supervisor the fusion welding process along with their certifications, training and qualifications for performing the fusion welding process for high density polyethylene pipe (HDPE).

B. Contractors wishing to bid on this project shall perform an on-site investigation prior to submitting a bid for the project. Contractor shall field verify all equipment and materials that will be affected by the work of this project and report any concerns to the Engineer at least ten (10) business days prior to the bid opening date.

1.3 GENERAL PROJECT DESCRIPTION

A. The following is a general description of the project and may not include all materials and labor required or covered elsewhere in the contract documents.

1. Furnish and install a concrete curling rink floor including transmission main piping, sand, floor insulation, vapor barrier, pipe supports, piping, reinforcement, concrete, expansion joint, accessories and all other necessary materials and labors required for a complete operating system.

2. Schedule and pay for all testing and start up services required by the contract documents pertaining to the ice system.

1.4 REINSPECTION

A. In addition to the Engineer's standard site visits throughout the project, the Engineer will be on-site at the end of the project to generate a list of uncompleted, or unsatisfactorily completed items, (i.e., punch list) after the project is reported complete by the Contractor and prior to the project's required completion date. If the items are not satisfactorily completed and should additional site visits be required to follow up on uncompleted items, the Engineer shall be compensated at the typically hourly rate for each person involved in the re-inspection. The Contractor will be back charged the amount of the additional inspections.

1.5 RELATED SECTIONS

A. Division 0, Division 1, General and Supplementary Conditions.

B. Section 131813 - Ice Rink Floor System.

C. Section 131814 - Ice Rink Piping, Valves and Accessories.

1.6 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ACI 305 - Hot Weather Concreting.

C. ACI 306 - Cold Weather Concreting.

D. ACI 309 - Recommended Practices for Consolidation of Concrete.

E. ASHRAE/ANSI - 15 Safety Code for Mechanical Refrigeration.

F. ASME B31.5 - Refrigeration Pressure Piping Code.

G. IEEE Standard 112 - Standard Test Procedure for Polyphase Induction Motors and Generators (Method B).

H. NECA - Standard of Installation.

I. NEMA ICS2 - Industrial Control Devices, Controllers and Assemblies.

J. NEMA -MG - Motor and Generators.

K. NEMA TC2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).

L. NEMA-WC5 - Thermoplastic Insulated Wire and Cable.

M. NEMA -WC7 - Cross Linked Thermosetting Poly Insulated Wire and Cable.

N. NEMA 250 - Enclosures for Electrical Equipment.

O. NFPA 70 - National Electrical Code.

P. UL-83 - Thermoplastic - Insulated Wires and Cables.

Q. UL 360 - Liquid-Tight Flexible Steel Conduit.

R. UL 508 - Industrial Control Equipment.

S. UL 651 - Schedule 40 and 80 PVC Conduit.

T. UL 797 - Electrical Metallic Tubing.

U. UL 810 – Capacitors.

V. UL 845 - Control Panels.

W. International Fire Code.

X. International Building Code.

Y. International Mechanical Code.

1.7 CODES AND STANDARDS

A. All parts of the project shall be performed in accordance with the most recent version of the following codes and standards and all amendments:

1. State Building Codes.

2. State Electrical Codes.

3. State Mechanical Codes.

4. National Fire Protection Association Codes.

5. ANSI/ASHRAE 15 -Safety Code for Mechanical Refrigeration.

6. ASHRAE 34-Number Designations and Safety Classification of Refrigerants .

7. OSHA.

8. American Standard Code for Pressure Piping ASA B31.1.

9. American Standard Code for Refrigeration Piping ASA B31.

10. American Standard Code for Pressure Vessels.

11. ANSI/IIAR Standard.

1.8 SUBMITTALS

A. See General Conditions, Division 0 and additional requirements below.

B. The Contractor's approval stamp is required on all submittals and indicates that the Contractor has reviewed all materials and has a completed understanding of the specifications and requirements. Contractor shall clearly mark all deviations from the contract documents on all submittals.

C. Progress Schedule. Submit progress schedule before project begins.

D. Shop Drawings. All submittals shall conform to the requirements the General Conditions and these specifications.

E. Test Reports. Submit one (1) electronic copy of test reports to the Engineer when specified.

F. Certifications. Submit one (1) electronic copy of certifications to the Engineer when specified.

G. Operation and Maintenance Manuals

1. Submit one (1) electronic copy for initial review. After reviewed by the Engineer and all changes are made, submit one (1) final electronic copy and two (2) final printed copies for the Owners use.

2. Prepare manuals, instructions and data by personnel experienced in maintenance and operation of described products.

3. Prepare data in form of an instructional manual.

4. Binders: Commercial quality, 8 ½ x 11-inch text pages, three D size, 3 ring binders with durable plastic covers, 2-inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

5. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.

6. Sheets: Printed sheets in Part 1 shall have page protectors for each sheet. Printed sheets at the start and end of each additional section of the manual shall have page protectors.

7. Drawings: Provide with reinforced edges.

8. Manual covers to have printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of manual when multiple manuals are required.

9. Contents of Manuals:

a. Table of Contents: Provide for each volume with each product or system identified, typed on white paper.

b. **Part 1:** Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, subcontractors, and major equipment suppliers for each product or system.

c. **Part 2:** Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:

1) Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

2) Description of each unit, equipment or system.

3) Significant design criteria, normal operating characteristics and limiting conditions for each equipment and system. Include performance curves, engineering data and tests.

4) Operating Procedures: Include start-up, break-in, routine normal operating instructions, sequences, and shutdown of the system including, but not limited to, system checks, controls, stopping, valve number references, typical fluid levels in all vessels, emergency instructions, etc. Include winter, summer, and any other special operating instructions.

5) Start-up and shut-down procedure description including a step by step written description of how to start up and shutdown the system including, but not limited to, system checks, safety device checks, valves number references, typical levels in vessels, etc.

6) Instructions of care and maintenance instructions for equipment and systems including, but not limited to, manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

7) Maintenance Requirements: Include routine maintenance procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

8) List of equipment.

9) Parts list for each component.

10) Valve list that includes valve number, description, manufacturer, operation (normal closed or open, etc.). Provide schematic drawing of refrigeration system that shows locations of each valve.

11) Servicing and lubrication schedule, list of lubricants required.

12) Troubleshooting information.

d. **Part 3:** Project documents and certificates, including the following:

1) Approved shop drawings and product data.

2) Manufacturer's printed operation and maintenance instructions.

3) Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

4) Air and water balance reports.

5) Test records

a) Material and fluid tests for concrete, sand, glycol, $CaCl_2$, etc.
b) Pipe pressure tests for refrigeration system piping, rink floor piping, and transmission mains.

6) Certifications of inspections by regulatory agencies.

7) Warranties. Including project warranty and all equipment and material warranties.

8) Maintenance Drawings – Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

9) Record Drawings including pipe routing, joint locations on all underground transmission mains, wiring diagrams, equipment layout, valve locations, etc. Reduce to half size and insert into back of manual

10) Training and reporting forms.

a) Provide daily checklist form for recording operation of refrigeration system.

1.9 WARRANTY/GUARANTY

A. In addition to the standard manufacturer's warranty on all equipment and materials, the contractor shall provide a standard one-year materials and labor warranty on all work performed for this project.

1.10 PRODUCT DELIVERY, STORAGE AND HANDLING REQUIREMENTS

A. Transport, handle, store and protect products in accordance with manufacturer's recommendations. Secure products at all times.

B. Store products with seals and labels intact and legible.

C. Store products in a secure environment at all times.

D. Provide adequate labor to handle products and prevent damage.

E. All damaged materials and equipment will be rejected.

**PART 2 - PRODUCTS**

2.1 ELECTRICAL

A. See requirements in Section 131812 - Ice Rink Refrigeration Systems.

2.2 GENERAL CONCRETE REQUIREMENTS

A. This section refers to all concrete work outside the ice rink floor unless otherwise noted. For concrete ice rink floor see Section 131813 - Ice Rink Floor.

B. Concrete Mix:

1. Submit mix design fourteen (14) business days prior to placement.

2. Concrete shall be produced by a Ready-Mix Plant approved by the Engineer. Concrete shall meet the requirement of ASTM C94 - Standard Specifications for Ready Mix Concrete.

3. Mix Design Requirements

| | |
|---|---|
| Minimum 28-day compressive strength | 4000 psi |
| Coarse aggregate size | 3/4 inch to #44<br>(ASTM C33 No. 67) |
| Maximum water to cement ratio | 0.45 |
| Maximum pozzolan content | 25% of cement content |
| Minimum cement plus pozzolan content | 564 lbs/cy |

| | |
|---|---|
| Slump | 3 inches +/- 1 inch |
| Entrained air content | 6% +/- 1.5% |

C. Material Requirements

1. Cement: Shall meet ASTM C150, Type 1

2. Aggregates: Shall meet ASTM C33

3. Water: Shall be clean, potable water.

4. Admixtures:

a. Air Entrainment: Shall meet ASTM C260

b. Water Reducing Agent: Shall meet ASTM C494, Type A

c. Fly Ash: Shall meet ASTM C618 class C or F.

D. Reinforcement and Formwork

1. Formwork shall meet ACI 347 - Recommended Practice for Concrete Formwork.

2. Reinforcement shall be tagged and conform to ASTM A615 Grade 60. Installation shall meet ACI 315.

3. Tire wire: Shall be 16-gauge black annealed wire or heavier.

E. Related General Materials

1. Polyethylene Sheeting: Shall conform to ASTM C171.

2. Finishing Compound: Thoroseal by Thoro System Products or equal.

3. Expansion Joint: Bituminous fiber type meeting ASTM D1751.

4. Joint Sealant: Two part - self leveling, polyurethane sealant. MasterSeal SL2 by BASF or equal.

5. Anchor Adhesive: For anchoring dowels. Hilti HIT Doweling Adhesive C-100 by Hilti Fastening Systems, Powers Pure 110+, or equal.

**PART 3 - EXECUTION**

3.1 CONSTRUCTION UTILITIES AND FACILITIES

A. Unless specified elsewhere, all temporary utilities and facilities required to complete the project shall be the responsibility of the contractor and costs for these utilities and facilities shall be incidental to the project costs.

3.2 INSPECTION

A. The Contractor shall notify the Engineer a minimum of seven (7) business days prior to the following phases of the work:

1. Completion of subgrade preparation.

2. Completion of transmission main installation

3. Start of floor insulation.

4. Completion of floor insulation.

5. Start of rink piping and header piping.

6. Completion of rink piping and header piping.

7. Final flushing of all piping systems.

8. Start of concrete placement.

9. Start of refrigeration piping insulation installation.

10. Start and completion of all pressure tests.

11. Start up and Training

B. See Section 1.04 of this section for requirements regarding re-inspection of uncompleted or unsatisfactorily completed items.

3.3 DEMOLITION

A. The Contractor is responsible for all demolition and disposal of the entire existing curling rink floor system (and all related piping, valves, supports) including but not limited to the following:

1. Curling rink floors.

2. Other related systems or areas as noted on the Drawings.

B. The following items shall be salvaged, protected and stored:

1. Secondary refrigerant solution.

C. Drain fluids from all systems prior to starting demolition.

1. Secondary refrigerant solutions.

a. Remove all fluids in curling rink floor, refrigeration system as necessary for new construction of transmission piping, headers, transmission mains and all related piping systems and equipment.

b. Salvage and store existing fluids for reuse. Test fluid and provide additional fluid and inhibitors as required to ensure the fluid is within the specified requirements and the manufacturers requirements.

c. Remove all possible water in the system in all piping systems and curling rink floor zones using air or some other method.

d. **ALTERNATE BID 1** - Dispose of all fluids in accordance with all local and state codes.

e. Reinstall existing and adjusted ethylene glycol solution in all systems. Furnish and install additional glycol as needed to provide a full operating charge in all systems.

2. For projects where the chiller is not being replaced and brine is the secondary refrigerant, after draining fluids, the chiller vessel must be pressure tested and all moisture removed immediately after removing the fluids. The vessel then shall be charged with nitrogen and held until the renovation of the ice system is complete and the system is ready to be filled with the new brine fluid.

D. Disconnect all electrical systems prior to starting demolition. Coordinate utility service outages with the Owner, Engineer and utility company since the main facility may still be in use. 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. In particular, all security and safety systems must be maintained in operation at all times as required by the Owner and local officials. This includes security and safety lighting.

E. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed. Repair adjacent construction and finishes damaged during demolition and extension work.

F. Cut all buried piping, that is indicated to be abandoned, flush with finished floor unless otherwise noted. Fill all buried piping indicated to abandon in place with flowable grout. Finish floor to match existing adjacent floors.

G. Remove and dispose of existing curling rink floor, piping, supports, transmission mains, insulation, vapor barrier, expansions joints and all associated materials. Remove and dispose of all materials off-site.

H. Contractor shall saw cut all concrete full depth to the size specified using water to minimize dust. Remove and dispose of concrete off site. Care shall be taken by the Contractor not to damage perimeter or adjacent concrete where indicated to remain.

I. Excavate sub-soils as require for installation of new systems. Remove and dispose of all existing sub-soil heating system piping, headers, mains and all related materials. Stockpile soils outside at the designated area. Re-use soils where approved placing within 0.05’ of specified or required elevation. All extra material shall be removed and disposed of off-site.

J. All mechanical equipment, piping, valves, electrical systems and other items related to the refrigeration or ice system resulting from required demolition shall be removed and disposed of off-site by the unless specifically designated to be salvaged.

K. All disposals shall occur off-site and shall be performed in accordance with applicable authorities having jurisdiction.

L. PROTECTION: The Contractor shall be responsible for covering all electrical systems, control systems, sensitive equipment, scoreboards, bleacher system, doorways, HVAC intakes, and other areas adjacent to areas where demolition will take place with polyethylene sheeting prior to the start of demolition.

M. VENTILATION: The Contractor shall be responsible for providing proper ventilation in the facility during construction of the project and to prevent unwanted vapors or odors from reaching other parts of the facility.

## 3.4 CLEANING, PAINTING AND RESTORATION

A. Contractor shall be responsible for cleaning the immediate construction area including the rink floor, perimeter concrete where work or demolition is conducted and the mechanical rooms where work is being performed.

B. Patch and paint all holes caused or left by construction and demolition work. Match adjacent textures and colors.

C. Clean all equipment and piping to original condition after project has been completed.

D. Touch up all equipment paint, using paint provided by the manufacturer, after the installation is complete.

E. All piping, valves, and other items related to the ice system resulting from required demolition shall be removed and disposed of off-site by the contractor unless specifically designated to be salvaged.

3.5 CONCRETE WORK

A. Reinforcement shall be installed with a minimum of 2" of cover. Adequately support reinforcement with concrete blocks or wire/plastic chairs. Splices shall be installed with minimum lapping distances shown on the plans and bars wired tightly together.

B. Concrete Placement: shall conform to ACI 309 - Consolidation, ACI 306 - Cold Weather Placement, ACI 307 - Hot Weather Placement.

C. All new concrete adjacent to the ice rink floor shall be placed at the same tolerance as specified for the ice rink floor and shall use the same benchmark, unless otherwise noted.

D. Finishing: Apply float finish and uniform textured surface to all interior slabs. Apply broom finish to exterior slabs. Edge or chamfered the edge of all concrete that is adjacent an expansion or construction joint.

E. Joints: Install control and construction joints as follows unless otherwise stated elsewhere:

1. Install control joints every 10 feet o.c. in each direction.

2. Install construction joints with expansion material and caulk at any new cold joints.

F. Curing: Cover with burlap-polyethylene and damp cure for a minimum of 7 days.

G. Testing: Contractor shall hire a testing agency to perform the following tests and shall pay for all testing and laboratory costs. Tests shall include air content (ASTM C 231), slump (ASTM C143) and compressive strength (ASTM C31, C39) for all concrete placed. Three (3) copies of the results shall be submitted to the Engineer.

3.6 START-UP AND FOLLOW UP SERVICES

**A. The refrigeration system shall not be started until all local and state governing authorities have inspected and provided written approval for all systems related to, and including the refrigeration, piping, controls, ventilation, ice equipment room and building and all other related systems; and all alarms and controls have been thoroughly tested for all conditions and modes of operations.**

B. Provide documentation of all piping pressures tests and vacuum tests on systems. All tests shall be witnessed by Owner or Owner's representatives.

C. After all piping systems have been tested according to the specifications and current codes and have been thoroughly cleaned, fill the secondary piping system with a complete charge of the specified secondary refrigerant. Remove all free air from the systems. The contractor shall be responsible for removing air from the system throughout the warranty period of the project. The contractor shall take every precaution to fill the piping system in such a manner that results in maximum air removal and avoids trapping air in the system (for example, the curling rink floor). If air becomes trapped in the piping system, the contractor shall remove the fluid and refill the system as many times as required until the air is removed. Provide field report for each site visit where air is removed, or systems checked clearly detailing processes and observations.

D. Provide all additional secondary refrigerants necessary to maintain fully charged systems throughout the warranty period of the project. Test all refrigerants and provide final test reports of each refrigerant (including moisture content, inhibitor concentration, solids, refrigerant content, etc.).

E. Concrete curling rink floor shall cure a minimum of 28 days prior to lowering the temperature of the ice rink floor. After the 28-day cure, lower the temperature of the ice rink floor at a maximum rate of 1-degree F per hour until a slab temperature of 34 degrees F and then 1-degree F every 2 hours until a slab temperature of

16-18 degrees F or as desired by the Owner. Apply water only after the desired operating temperature is reached. Provide documentation that procedure was witnessed by Owner or Owner representative.

F. Provide the Owner's operating staff with eight (8) hours of start-up assistance for the purpose of removing air from the piping system. Start-up assistance session shall be coordinated with Owner's schedule.

G. The Contractor shall provide the following follow-up services, at minimum. The cost of these services shall be incidental.

1. Site visits during the warranty period as required to make adjustments to any part of the system as required to optimize the operation of the ice system, including but not limited to air removal in the piping system.

H. Build the first ice sheet on the curling rink floor. The ice sheet shall be built in thin layers of water and in accordance with industry standard practices. This includes:

1. Build the black ice layer of ice (ice layer prior to painting).

2. Furnish and install white paint on entire curling rink floors and ice markings as shown on the drawings and/or specified herein. Paint shall be applied at rates recommended by the paint manufacturer and supplier (3 coats minimum for the white paint) and to achieve full uniform coverage of the ice surface, marking areas, etc. Logos shall be furnished and installed by the Owner.

3. Build the ice over the ice markings to the ice thickness desired by the Owner.

4. Train the Owners staff in building the first ice sheet.

## 3.7 COORDINATION OF WORK

A. The contractor shall be responsible for coordinating all work in Division 13 – Ice Rink. The contractor shall also work closely with the other subcontractors on the project and help coordinate all associated structural, electrical and mechanical systems.

## 3.8 PERMITS

A. The contractor shall apply for and obtain all permits required to construct the project at no additional cost to the Owner unless specified otherwise.

**END OF SECTION**

## SECTION 13 1813 - ICE RINK FLOOR SYSTEM

### PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sand.

B. Insulation, jacketing and vapor barrier.

C. Pipe and reinforcement support chairs.

D. Reinforcement.

E. Pipe and fittings.

F. Expansion joint.

G. Concrete.

H. General materials.

I. Temperature sensors and monitors for sub-floor and ice rink floor.

J. Subgrade preparation.

K. Secondary Refrigerant Solution.

1.2 RELATED SECTIONS

A. Division 0, Division, General and Supplementary Conditions.

B. Section 131811 - Ice Rink General Requirements.

C. Section 131815 - Ice Rink Waste Heat Recovery Systems.

D. Section 131817 – Ice Rink Central Control System.

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ACI 304 - Concrete Placement.

C. ACI 305 - Hot Weather Concreting.

D. ACI 306 - Cold Weather Concreting.

E. ACI 309 - Recommended Practices for Consolidation of Concrete.

F. ASTM C94 - Standard Specifications for Ready Mix Concrete.

G. ASTM D 2513 - Thermoplastic Gas Pressure Pipe.

H. ASTM D 2683 - Socket Type Polyethylene Fittings.

I. ASTM D 3261 - Butt Fusion Polyethylene Fittings.

J. ASTM D 3350 - Standard Specification for Polyethylene Plastic Pipe and Fittings.

K. ASTM F 2164-21 Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure

L. NSF Standard 61 - Plastic Piping Components and Related Materials.

M. AWWA C901 - Polyethylene Pipe.

N. The Plastic Pipe Institute Handbook of Polyethylene Pipe.

O. Pipe Manufacturer for fusion welding procedure.

1.4 SUBMITTALS

A. Shop Drawings. All submittals shall conform to the requirements of the General Conditions and Section 131811 - Ice Rink General Requirements.

B. Test Reports. Submit four (4) copies of test reports to the Engineer when specified.

C. Gradation of clean sand fill.

D. Concrete mix design. Submit fifteen (15) business days prior to placement.

E. Two (2) samples of a typical fusion welded pipe to fitting connection. Samples shall come from a demonstration performed in the field prior to placement of polyethylene pipe.

F. Rink subgrade and top of pipe surveys.

1.5 WARRANTY/GUARANTY

A. As required in Section 131811 - Ice Rink General Requirements

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING REQUIREMENTS

A. As required in Section 131811 - Ice Rink General Requirements.

**PART 2 - PRODUCTS**

2.1 SAND

A. Sub-Floor: Clean sand consisting of sound, durable particles. Material gradation shall meet 100% passing the #4 sieve and not more than 5% passing the 200 sieve. Material shall be clean, free of all debris, roots, or other foreign material or chemicals.

B. Rink Floor: Washed clean sand consisting of sound, durable particles. Material gradation shall meet 100% passing the #4 sieve and not more than 5% passing the 200 sieve. Material shall be clean, free of all debris, roots, or other foreign material or chemicals.

## 2.2 INSULATION, JACKETING AND VAPOR BARRIER

A. Approved manufacturers: Styrofoam brand by the Dow Chemical Company, CertainTeed, Ownes-Corning, DiversiFoam, or equal.

B. Floor Insulation: Insulation material shall meet ASTM C 578 Type IV with a minimum compressive strength of 25 psi, maximum water absorption of 0.1% by volume (ASTM C272) and an R-value per inch at 75 F of 5 Fxsfxh/Btu. Provide the sheet dimensions as indicated on the drawings.

C. Pipe Insulation System:

1. Direct Bury: As specified in Section 131814 – Ice Rink Piping, Valves and Accessories.

D. Accessories: Provide all adhesives, sealants and other products as required by the manufacturer to provide a completely sealed system. Provide vapor barrier for the piping that is non-flammable and fire resistant for all systems operating below 65 F.

E. Vapor Barrier (for Rink Floor):

1. Concrete Rink Floor: Shall conform to ASTM D-4397 for Clear Polyethylene Film except the thickness shall be 6-mil. Tensile strength shall be a minimum of 1700 psi (long direction) and Elongation shall be a minimum of 225% (long direction). The materials shall be supplied in 20’-0” x 100’-0” minimum size sheets. Provide tape manufactured for sealing the seams of poly sheeting.

2. Sand Rink Floor: Shall conform to ASTM D-4397 for Polyethylene Film except the thickness shall be 10-mil. The materials shall be supplied and installed in one piece. Seams will not be accepted.

## 2.3 PIPE AND REBAR SUPPORT CHAIR

A. Approved Manufacturers: Hunter Wire Products or equal.

B. U-type or M-type configuration designed for both supporting rink piping and reinforcement or equal. Six (6) foot long sections.

C. Material: Wire shall be a minimum of #7-gauge (0.187") steel. Base plate shall be a minimum of 20-gauge steel for sand floors and 24-gauge steel for concrete floors except that 20-gauge steel shall be used on all rink floors with steel rink piping.

D. Shims (for adjusting pipe elevation): Shims shall be plastic or steel and shall be a minimum size of 2” wide x 2” long to provide full support beneath the pipe and rebar support chair.

## 2.4 REINFORCEMENT

A. Reinforcement: Shall be tagged and conform to ASTM A615 Grade 60.

B. Wire Mesh: 6x6 W2.1/W2.1 (8 gauge) steel mesh conforming to ASTM 1064.

C. Tie Wire: Shall be 16-gauge yellow-coated annealed wire or heavier.

2.5 PIPE AND FITTINGS

A. Polyethylene Pipe:

1. SDR 17, pressure rating 100 psi (rink transmission pipe only)

| | | | |
|---|---|---|---|
| Nominal I.D. | 1" | 6" | 8" |
| Actual O.D. | 1.135 | 6.625" | 8.625" |
| Wall Thickness* | 0.077" | 0.390" | 0.507 |

*Minimum thickness. Wall thickness shall be within 10% of that specified.

2. SDR 11, pressure rating 200 psi (rink and subfloor piping and headers, subfloor transmission mains).

| | | | | | | |
|---|---|---|---|---|---|---|
| Nominal I.D. | 3/4" | 1" | 3" | 6" | 8" | 10” |
| Actual O.D. | 1.050" | 1.315" | 3.5" | 6.625" | 8.625" | 10.750” |
| Wall Thickness* | 0.095" | 0.119" | 0.318" | 0.602" | 0.784 | |

*Minimum thickness. Wall thickness shall be within 10% of that specified.

3. Shall be high density polyethylene complying with requirements of ASTM D3350 cell classification and have a Plastic Pipe Institute (PPI) designation of PE4710. Minimum density shall be 58 lbs/cf (0.957 gm/cc).

4. Joints/Connections: Fusion welded. Welding process shall be performed by fully trained personnel in the fusion welding process.

5. Fittings:

a. Approved manufacturers: Charter Plastics, Performance Pipe, Rahn, Georg Fisher, Polycam or equal.

b. All fittings shall be socket type and conform to ASTM 2683. Fittings shall be manufactured and not field or shop fabricated. The inside diameter of the fittings shall be equal to the inside diameter of the pipe.

c. Rink piping return bends: Construct as detailed on the drawings. As alternatives:

1) POLY-CAM (763.786.6682) Series 734 polyethylene HDPE 3408 socket U-Bend fittings with I.D. of 1.310 inches at 4” o.c. At this time, the new POLY-CAM bend at 3.5” o.c. is NOT APPROVED.

2) GES Geoglide 180 HDPE pre-molded socket return bend. Only the newest design and product will be approved. www.gesgeo.com

d. Use manufacturer recommended coupling when fusion welding pipe of different gauges or wall thickness.

6. The pipe shall have product traceability by inclusion of product code on the exterior of the pipe and include the manufacturer, the date of manufacture, the lot and supplier of the raw material, the location of the manufacture, and the production shift of which the product was produced.

2.6 PERIMETER FOAM

A. Material shall be polyethylene foam as manufactured by Ethafoam or equal.

B. Minimum density of 2.1 lbs/cf. Minimum R-value of 2.3.

C. Thickness as shown on the plans.

D. Provide rolls of maximum length to minimize the number of seams.

## 2.7 COMPRESSION SEAL AND EXPANSION JOINT MATERIALS

A. Compression Seals: Shall be D.S. Brown Delastic or equal.

1. D.S. Brown Delastic Catelog Numbers shall be as follows:

   a. For ½" joint (width at time of concrete placement) shall be Catalog No. E-1006.

   b. For 1" joint (width at time concrete placement) shall be Catalog No. CV-1752.

   c. Provide dimensions as required for the joint width shown on the drawings.

2. Material shall be polyethylene, non-absorbent, non-staining.

3. Compression seal material shall meet the parameters for the specified D.S Brown product.

4. Color: Black

5. Expansion Joint Material: Ceramar by W.R. Meadows or extruded polystyrene insulation (thickness of expansion joint by depth of rink floor) in one piece with top scored to depth of expansion joint material or as recommended by the manufacturer.

## 2.8 CONCRETE

A. This section refers to concrete for the ice rink floor only. For perimeter slab concrete and other miscellaneous concrete requirements see Ice Rink General Requirements Section.

B. Concrete Mix:

1. Submit mix design fifteen (15) business days prior to placement.

2. Concrete shall be produced by a Ready-Mix Plant approved by the Engineer. Concrete shall meet the requirement of ASTM C94 - Standard Specifications for Ready Mix Concrete.

3. Mix Design Requirements. Prepare design mix for type and strength of concrete in accordance with applicable provisions of ASTM C94, Alternative #3.

| | |
|---|---|
| Minimum 28-day compressive strength | 5,000 psi |
| Coarse aggregate size | 3/4 inches to #4<br>(ASTM C33 No. 67) |
| Maximum water to cement ratio | 0.40 |
| Minimum cement content | 600 lbs/cy |
| Fly ash | 15% of cement content max. |
| High Range Water Reducing Admixture | |
| Slump (prior to addition of HRWRA) | 3 inches maximum |
| Slump (after addition of HRWRA) | 7 inches maximum |
| Air content | 3% maximum |

4. Proportion aggregates such that the concrete mix adequately flows into all corners and around reinforcement without segregating, leaving voids or producing honeycombs. There shall be no free water in the mix.

5. The consistency of the concrete mix shall be uniform and such that the cement and other ingredients are uniformly distributed throughout the mix and such that the mortar clings to the coarse aggregate.

C. Material Requirements

1. Cement: Shall be Portland Cement that meets ASTM C150, Type I or Type I/II. Only the specified manufacturer submitted with design mix will be allowed.

2. Fine Aggregates: Shall be clean, natural sand free of loam, clay and other deleterious or foreign materials. Shall meet ASTM C33 and come from a single source.

3. Coarse Aggregates: Shall be clean, processed aggregates free of loam, clay or other deleterious or foreign materials. Shall be crushed stone or crushed gravel.

4. Water: Shall be clean, potable water. Maximum concentration of chloride ions of 0.1%.

5. Admixtures: All admixtures shall conform to ASTM C494. A representative for the HRWRA supplier shall be on-site at the start of the concrete placement until consistency in the mix has been proven by the testing agency. No changes are allowed once the design mix is approved.

   a. Air Entrainment:

      1) Shall meet ASTM C260.

      2) Approved manufacturers:
         Axim Concrete Tech. - Catexol AE 260, VR
         Euclid Chem. Co. - AEA 92S, AEA 92, Air Mix 250
         General Resource Tech - Polychem AE, VR
         GCP – Applied Technologies - Darex II AEA, Daravair 1000, 1400, Airalon 3000
         Master Builders - MB VR standard, Micro Air, MasterAir AE 90
         Sika Corporation – Sika AEA-14, Sika Multi AIR 25
         Premiere – ConAir

   b. Water Reducing Admixture:

      1) Shall meet ASTM C494, Type A and shall not contain more chloride ions than in potable water source with a maximum of 0.1%.

      2) Approved manufacturers:
         Axim Concrete Tech. - Catexol 800N, 1000N, 2000N
         Euclid Chem. Co. - Eucon MR, WR, WR-91
         General Resource Tech - Polychem 1000, KB1000, 400NC
         GCP – Applied Technologies - WRDA 82, MIRA 110
         Master Builders - Pozzolith 220N, MasterPolyhead 997
         Sika Corporation - Sikament HP, Plastocrete 169, 161
         Premiere – OptiFlo MR

   c. High Range Water Reducing Admixture (HRWRA) Superplasticizer

      1) Shall meet ASTM C494, Type F or G and shall not contain more chloride ions than in potable water source with a maximum of 0.1%.

      2) Approved manufacturers:
         Euclid Chem. Co. - Eucon 37
         GCP – Applied Technologies - ADVA 140M, ADVA CAST 575, 600
         Sika Corporation – Sikament 686
         Master Builders – MasterGlenium 7500
         Premiere – OptiFlo MR

## 2.9 GENERAL MATERIALS

A. Nylon Ties: Shall be 3/16" wide and UL recognized. For sand rink floor ties shall have a minimum tensile strength of 100 lbs, with metal tabs. For concrete rink floor ties shall have a minimum tensile strength of 50 lbs.

B. Moisture Curing Covers: Shall be a curing cover such Ultra Cure by McTech Group, Hydrocure by PNA Construction Technologies or equal. Polyethylene sheeting is not approved.

2.10 TEMPERATURE SENSOR AND MONITORS

A. Provide sensors for sub-floor heating system and the rink floor. See drawings for number and location. Provide one (1) monitor with selector switch for both sensors.

B. Approved Manufacturers: Omega Engineering, Thermokon, Kele, Honeywell, or equal.

C. Sensor (thermistor or RTD):

1. Accuracy: +/- 1% accuracy of measuring range.

2. Sensor pocket shall be aluminum.

3. Protection: Shall be protected against humidity, vibration and mechanical overstress.

4. Construction: Shall be suitable for temperature extremes and immune to the effects of moisture and condensation.

5. Provide wiring as required by monitor manufacturer.

6. Other control systems – provide compatible 4-20mA sensor.

D. Box: Iron or steel construction with 3/4" hub size, threaded connections, flat removable iron or steel cover with neoprene gasket.

E. Conduit: Schedule 80 PVC from box to mechanical room and from box to depth of sensor to prevent heat transfer.

F. Wire: Provide all wiring sizes for application and per code requirements.

G. Monitor: Omega Model DP400 series, Honeywell T775, or equal.

2.11 CONCRETE PATCHING AND REPAIR MORTAR (PERIMETER CONCRETE)

A. Approved manufacturers: BASF MasterEmaco T 545 (formerly Set 45), BASF MasterEmaco T 310CI, 1260 MG-KRETE by Imoc, Five Star Epoxy Patch by Five Star Products, or equal.

B. This product should only be used for patching existing perimeter concrete. Shall not be used for the rink floor. All other applications shall be approved by the Engineer prior to use.

C. One-compound magnesium phosphate-based or polymer-based patching mortar for horizontal surfaces and ambient and substrate temperatures below 20 F. Reaches minimum compressive strength of 2500 psi in one day. Very low drying shrinkage and resistant to freeze/thaw cycles.

2.12 CONCRETE PATCHING AND REPAIR MORTAR (RINK CONCRETE AGG POPOUTS AND CRACKS)

A. Approved manufacturers: EUCO Qwickjoint 200, Euclid Dural 452 LV, or equal.

B. This product should only be used for patching existing rink floor concrete. All other applications shall be approved by the Engineer prior to use.

C. Two-component material. Moisture intensive for bonding to dry or damp surfaces. Designed for use at 40F and above.

2.13 CONCRETE PATCHING AND REPAIR MORTAR (RINK CONCRETE REPAIRS)

A. Approved manufacturers: MasterEmaco T1060 EX, EUCO #452 Epoxy System or equal.

B. This product should only be used for patching existing rink floor concrete. All other applications shall be approved by the Engineer prior to use.

C. Two-component material. Moisture intensive for bonding to dry or damp surfaces. Designed for use at 40F and above.

2.14 SECONDARY REFRIGERANT

A. Ethylene Glycol Solution

1. Furnish and install enough 35% by volume inhibited ethylene glycol and deionized water solution to provide a complete operating charge with the salvaged ethylene glycol solution. The fluid shall be an industrial heat transfer fluid specifically designed for HVAC systems.

2. Approved Manufacturers: Dow Chemical Company Dowtherm SR-1, Texaco Texcool E100, Dynalene, Interstate Chemical Company Intercool, or equal.

3. The solution shall have a factory mixed corrosion inhibitor or neutralizing agent and anti-foaming agent to minimize air entrainment.

4. The solution mixture shall meet the following parameters:

| **Parameter** | **35% EG** | **40% EG** | **45% EG** |
|---|---|---|---|
| Specific Gravity @ 15F | 1.064 | 1.077 | 1.077 |
| Viscosity @15F | 7.500 | 9.3017 | |
| Freezing Point | -1.5 F | -9.8 F | -17.5 F |
| pH | 8.0 to 9.2 | 8.0 to 9.2 | 8.0 to 9.2 |
| Density @ 15F | 66.37 lbs./cf | 68 lbs./cf | |
| Specific Heat @15F | 0.828 BTU/lb. F | 0.700 BTU/lb. F | 0.797 BTU/lb. F |
| Thermal Conductivity @15F | 0.23 BTU/hr-SF | 0.21 BTU/hr-SF | 0.21 BTU/hr-ft – SF |

5. The deionized water shall conform to the following properties in maximum allowable concentrations:

| | |
|---|---|
| Calcium Carbonate Hardness | 100 ppm |
| Chlorides | 25 ppm |
| Sulfates | 25 ppm |

6. Submit a product data sheet and MSDS sheet for the solution including the inhibitor and/or neutralizing agent.

7. Provide a weather resistant tag on the fill valve for the system that includes description of fluid, freezing and burst point, total gallons of system, Material Safety Data Sheet reference and date of original charge.

8. Provide certified test results for all solutions in systems. At minimum samples for the secondary refrigerant solution shall be drawn at the following times:

a. 3 months after start-up.

b. 11 months after start-up.

**PART 3 - EXECUTION**

3.1 INSPECTION

A. The Contractor shall notify the Engineer a minimum of seven (7) business days prior to the phases of work described in the Ice Rink General Requirements Section. Piping shall not be covered without notifying the Engineer.

3.2 EXCAVATION AND BACKFILL

A. The Contractor shall be responsible for verifying the location of all existing piping, electrical, and other utilities prior to excavation.

B. Benchmark: Contractor shall provide an elevation survey of the existing perimeter concrete, every 10 linear feet, to the Engineer. The Engineer will review and determine the best location for a benchmark.

C. Excavation: All excavation shall be performed in accordance with OSHA regulations, to the depths shown on the drawings, and to the tolerances specified in the table below.

| Area | Tolerance |
|---|---|
| Pipe trenches and non-rink floor areas | +/- 0.03 feet (3/8”) |
| Rink floor subgrade for rink floor with a subfloor heating system | +/- 0.05 feet (5/8”) |
| Rink floor subgrade for rink floor without a subfloor heating system | +/- 0.015 feet (3/16”) |

D. Verification Surveys and Measurements: The ice rink contractor shall provide verification surveys in the following areas. Submit surveys and measurements to Engineer for review prior to installation of new rink floor system.

1. Perimeter concrete.

   a. Survey top of perimeter concrete within 2” of the rink floor edge every 10 feet around the entire perimeter of the rink floor. This information will be used by the Engineer to establish a benchmark to construct the rink floor.

   b. Measure ice rink floor opening to perimeter concrete at the following locations.
      i. Length. Provide 3 measurements total: one near each side and one at the center of the rink floor.
      ii. Width. Provide 3 measurements total: one near each end and one at the center of the rink floor.

2. Subgrade. Prior to the installation of the piping systems for the subfloor heating system, survey a 10-foot x10 foot grid pattern across the entire ice rink floor subgrade and include the benchmark elevation that was established in item 1 above.

3. Top of sand layer. Prior to installation of the floor insulation, survey 10-foot x 10-foot grid pattern across the entire final and finished ice rink floor sand layer for the subfloor heating system and include the benchmark elevation that was established in item 1 above.

E. Backfilling: All excavated areas shall be backfilled as soon as possible but not before compaction tests have been taken and approved where required. Backfill materials shall be placed in lifts less than 12 inches thick, uniformly compacted and follow the requirements of the geotechnical report, if report is available. Backfilled areas shall be fine graded to the tolerances specified in the table below. Care shall be taken while backfilling to protect the pipe from damage. Where frost has been removed from the rink floor subgrade, backfill material shall be placed within the optimum moisture content as recommended in the geotechnical report.

| Area | Tolerance |
|---|---|

| | |
|---|---|
| Pipe trenches and non-rink floor areas | +/- 0.03 feet (3/8”) |
| Rink floor subgrade for rink floor with a subfloor heating system | +/- 0.05 feet (5/8”) |
| Rink floor subgrade for rink floor without a subfloor heating system | +/- 0.015 feet (3/16”) |
| Rink floor subfloor heating system sand layer | +/- 0.015 feet (3/16”) |
| Rink floor sand (for sand floors only) | +/- 0.015 feet (3/16”) |

F. Compaction: Backfill material shall be uniformly compacted to the densities shown in the table below.

| **Area** | **Standard Proctor Density** |
|---|---|
| Pipe trenches within building footprint and other structural areas | 98% |
| Rink floor subgrade (below subfloor heating system) | 98% |
| Rink floor subfloor heating system sand layers 6” thick or less | 95% |
| Rink floor sand (for sand floors only) | 95% |

3.3 INSTALLATION OF PIPE

A. No changes to pipe alignment or elevation shall be made without approval from the Engineer.

B. All pipe shall be cleaned out prior to installation. Inspect pipe for defects and damage.

C. Buried piping shall be bedded in material recommended by the pipe manufacturer.

D. Rink and header piping shall be supported as shown on the drawings.

E. Support all piping in such a manner as to prevent all vibration and vertical or horizontal movement.

F. For polyethylene pipe, butt or socket fusion welds shall be used to connect pipe and fittings. Electro fusion welded couplings should only be used where it is not possible to make a butt and socket weld due to space constraints. In addition, electro fusion welded couplings and fittings shall not be used in the following locations:

1. In or beneath the ice rink floor system. This includes, but is not limited to, the header pipe systems for both the rink floor and subfloor systems and the rink floor and subfloor piping systems.

2. Under permanent bleacher systems except where transmission mains connect to header pipe outside of the rink floor perimeter.

3. Above ground piping systems.

3.4 INSULATION, JACKETING AND VAPOR BARRIER

A. Install floor insulation with staggered joints as required on the drawings. Ends shall be tightly butted together and secured. All cuts must be performed with a sharp-edged tool.

B. Install vapor barrier over insulation with a minimum of 18" overlap at all joints. All joints shall be taped.

C. Install pipe insulation on transmission mains as specified.

3.5 PIPE AND REBAR SUPPORT CHAIR

A. Install as shown on the drawings.

B. Additional supports shall be placed as close to the ice rink piping return bends as possible.

3.6 REINFORCEMENT

A. Reinforcement shall be installed as shown in the drawings.

B. Installation shall meet ACI 315. Reinforcement shall be installed with a minimum of 2" of cover unless otherwise noted on the drawings. Adequately support reinforcement with support chair where specified and concrete blocks. Terminate rebar 2” from the rink edge.

C. Splices shall be installed with minimum lapping distances shown on the plans and bars wired tightly together. If lapping distances are not shown on the plans the following lapping distances shall apply.

| **Reinforcement Bar Size** | **Lap Splice (inches)** | **90º Hook End** |
|---|---|---|
| #4 | 25 | 8 |
| #5 | 31 | 10 |
| #6 | 37 | 12 |

D. Wire mesh shall be placed over rink piping. The loose ends of the wire mesh shall be bent down. The wire mesh sheets shall be overlapped by a minimum of 6" and wired securely to the reinforcement bars at a minimum of 18" on center or as noted on drawings (whichever is the tighter spacing) in both directions and along all edges of mesh. Consider securing to pipe chairs as well to prevent floating of piping system during the concrete pour especially if air is used for testing the piping system. The mesh shall be tightly wired down in all locations. Terminate mesh 2" from the rink edge. Turn all wires down. Contractors shall monitor the location of the wire mesh throughout the concrete placement and finishing processes and provide additional securing as needed.

3.7 PIPE AND FITTINGS

A. All sub-floor heating and rink piping shall be continuous. There shall be no joints, splices or additional fittings other than were indicated on the drawings. Header and transmission main piping shall be supplied in typical lengths.

B. All piping and fittings shall be connected by fusion welding. Contractor shall perform and demonstrate in the field, by personal that will be working on this project, for the Engineer prior to placement of polyethylene pipe. Submit two (2) samples of a typical fusion welded joint from the demonstration.

C. All connections to the header pipe shall be at a 90-degree angle to the header pipe. No connections shall be made at an angle.

D. Contractor shall inspect the interior and exterior of all butt and socket joints wherever possible to assure there are no blockages and that joints are formed to manufacturer's specifications.

E. Fasten rink piping to chair supports with specified nylon ties as necessary to secure pipe in position. Varying temperatures may require less restrictions to allow pipe to move. End of ties shall be turned downward.

F. Placement:

1. Rink piping shall be installed within +/- 1/4" of the elevation shown on the drawings. Shims shall be used to adjust pipe elevations if necessary.

2. Verification Surveys and Measurements:

a. Surveys. When rink piping installation is complete the Contractor shall provide a survey of the top of the rink pipe. The survey shall be performed by an independent surveying company and signed by a professional engineer or registered land surveyor licensed in the state of the project. The survey equipment used must have recent documented certification of calibration

and must be of the highest accuracy to document the very tight tolerances specified for this work. At minimum, the survey locations shall include the following:

1) Top of rink pipe in a 10-foot x 10-foot grid pattern over the entire rink surface.

2) In addition, top of rink pipe at supply and return headers (next to elbow or tee fitting) at a 10-foot spacing.

3) In addition, the top of rink pipe along radii and ends of rink at a 10-foot spacing, 1 foot from edge of perimeter concrete.

4) In addition, the top of rink pipe along the row of support chairs on each side of the header trench at a 10-foot spacing.

5) In addition, perimeter concrete at edge of rink floor every 20 linear feet around entire perimeter of concrete.

The information shall be recorded and submitted to the engineer clearly showing top of pipe elevation in reference to the top of concrete elevation and the difference between the two elevations. The survey shall be completed in adequate time for the Engineer to verify the information and the Contractor to make adjustments prior to the concrete pour.

b. Goal insert locations. Provide measurements of each goal insert from center ice, from end of rink, and distance between inserts. 5 measurements total

3. Cleaning and Flushing: Thoroughly flush and clean all piping systems prior to installation and before installation of secondary refrigerants. Remove all water or other fluids used during the cleaning and flushing procedures. The Engineer shall be notified prior to any final cleaning or flushing.

G. Testing:

1. The entire sub-floor heating system including the headers and transmission mains and the entire rink piping system including the header and transmission mains shall be hydrostatically tested as two separate systems at 100 psi each for the first four (4) hours and reduced to 60 psi for an additional 20 hours with no pressure drop at either setting and in accordance with ASTM F2164-21 Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure. While each test is being set up the Contractor will likely need to add water for the first 2 to 3 hours as the pipe may stretch slightly. Each test shall not begin until the Contractor is confident all air is removed from the system and the system is completely filled with water. An Owner's representative shall witness and approve the test.

2. Once the initial testing is approved, the pressure shall be lowered to 50 psi and maintained until 48 hours after the sand and concrete placement is complete.

3. Gauges used for pressure tests must be designed for pressures greater than the test pressure. For example, a 100-psi gauge cannot be used for a 100-psi test. The scale on the gauge must be the next increment up from 100 psi.

H. Fill rink piping system with secondary refrigerant as specified in Section 131812 - Ice Rink Refrigeration System.

## 3.8 PERIMETER FOAM

A. Install the perimeter foam material in the longest pieces possible. A series of small sections will not be accepted.

3.9 COMPRESSION SEAL AND EXPANSION JOINT MATERIAL

A. Install extruded polystyrene insulation (thickness of expansion joint by depth of rink floor) in one piece with top scored to depth of expansion joint material or as recommended by the manufacturer.

B. After concrete has been placed and cured, remove the top piece of insulation.

C. Clean all dirt, debris and water from space between perimeter concrete and rink floor using a brush, vacuum or compressed air and as recommended by the manufacturer.

D. Install when concrete substrate is clean, sound, dry and cured for a minimum of 14 days and as recommended by the manufacturer.

E. Install the compression seal material in longest pieces possible and as recommended by the manufacturer. A series of small sections will not be accepted.

F. Install adhesive per manufacturer’s recommendations. Do not allow to freeze prior to installation. Store all components out of direct sunlight in a clean, dry location between 50 F and 90 F.

G. Install adhesive per manufacturer’s recommendations.

H. Install compression seal per manufacturer’s recommendations.

3.10 CONCRETE WORK

A. Quality Control:

1. A prepour meeting will be scheduled with the Engineer or Owner's representative to discuss the methods of placement, equipment, and quality control procedures.

2. A benchmark shall be approved by the Engineer prior to starting the pour.

3. The survey of the rink floor piping must be approved by the Engineer prior to concrete placement.

4. Prior to placement, an inspection of the rink floor shall be conducted and all debris, soil, trash, and standing water shall be removed before placement begins.

5. Concrete shall not be placed until authorized by the Engineer or the Owner's representative.

6. At least two (2) standby concrete trucks shall be available in case of equipment failure or loads are rejected.

7. Standby pumping equipment shall be on-site in case primary pumping equipment fails. Hand pushed wheelbarrows will not be accepted.

8. An extra vibrator shall be kept on-site.

9. The concrete placement for the rink floor shall take place as one continuous pour from start to finish. Method of placement, leveling, finishing and curing shall be approved by the Engineer and the Contractor responsible for the ice rink work.

10. Quality control personnel from the ready-mix company, HRWRA admixture supplier and the Contractor shall be present during the pour.

11. All concrete not meeting the approved design mix parameters will be rejected.

12. Testing:

a. Contractor shall hire a testing agency to perform the following tests and shall pay for all testing and laboratory costs.

b. Temperature: Measure the concrete temperature for each truck.

c. Slump: Measure the slump before and after adding the High Range Water Reducing Admixture (HRWRA)/Super Plasticizer for each truck. Tests shall be performed in accordance with ASTM C143.

d. Air Content: Tests shall be taken before and after adding the High Range Water Reducing Admixture (HRWRA)/Super Plasticizer during casting of cylinders. Tests shall be performed in accordance with ASTM C231.

e. Compressive Strength:

1) Make and cure at least one (1) set of test cylinders, consisting of four (4) individual cylinders, for every 50 cubic yards of concrete placed or fraction thereof. Test specimens and testing shall be performed in accordance with ASTM C31 and ASTM C39.

2) For each set of cylinders, test one specimen at seven (7) days, two specimens at twenty-eight (28) days and one hold. Acceptance shall be based on the average of the two 28-day tests.

f. All sampling and tests shall be taken at the point of placement unless otherwise specified.

g. An electronic copy of the test results shall be submitted to the Engineer as soon as the tests are completed.

B. Placement:

1. All concrete shall be placed and consolidated in accordance with ACI 304 (measuring, mixing, transporting), 305 (hot weather) and 306 (cold weather).

2. The method and manner of placing the concrete shall be such as to minimize the possibility of segregation of the aggregate, the displacement of the reinforcement, pipe or supports and damage to the floor insulation. Place concrete as near to the final position as possible. The vibrator shall not be used to transport or to flow concrete to the extents that causes segregation.

3. The pumping equipment used for conveyance of concrete the equipment shall be suitable for this type of work and have adequate capacity for the work. The pump shall be operated such that a continuous stream of concrete without air pockets is produced.

4. Proper precautions shall be taken to prevent the polyethylene headers from floating up during the pour.

5. Concrete shall be placed in maximum 12" layers in the header trench. Each layer shall be adequately consolidated before the next layer is placed.

6. Mechanical vibration shall be used to consolidate the concrete. Provide and use two (2) vibrators during the pour. Vibrators shall be capable of operating at frequencies sufficient to achieve thorough and uniform consolidation, but not less than 7000 impulses per minute. Methods such as spading shall be used to consolidate concrete in locations where it’s impossible to reach with a vibrator. Vibration shall not be applied directly to the reinforcement or piping. Placement and duration of the vibration shall be such to thoroughly consolidate the concrete without causing segregation or localized areas of grout.

7. Bridge screeds or super screeds shall not be used.

8. Concrete that has been contaminated by foreign materials shall not be deposited or shall be removed from the rink area. Concrete that has been partially hardened shall not be reworked or re-tempered and shall be removed from the rink area.

C. Finishing:

1. Immediately after placement and consolidation, the concrete shall be struck off, screeded, and leveled to the required elevation. Begin floating when the surface is ready and bleed water is no longer visible. Floating may be conducted either by hand or with a machine. Check for levelness, fill or cut as necessary, and refloat surface to a smooth, uniform, granular texture.

2. Chemical finishing aids or fogging system shall be used at the Contractor's discretion to prevent rapid surface moisture loss. Water shall not be added to the concrete at any time.

3. After floating, apply a trowel finish using a power-driven trowel. The Contractor shall determine the time to start troweling. Perform final troweling by a combination of hand and power-driven trowels, leaving the surface free of marks, and uniform in appearance and texture. Provide a smooth surface.

4. The perimeter edge of the rink floor, adjacent to the expansion joint, shall be edged or chamfered to 1/4" radius.

5. Surface Tolerance:

a. The top of slab elevation for the rink shall be continuously checked by the Contractor throughout the finishing operation with survey equipment.

1. The final concrete surface elevation shall be within +/- 1/4" from a true level plane.

D. Concrete Surface Verification Survey

1. When concrete placement installation for the rink floor is complete the Contractor shall provide a survey of the concrete surface. The survey shall be performed by an independent surveying company and signed by a professional engineer or registered land surveyor licensed in the state of the project. At minimum, the survey locations shall include the following:

a. Top of concrete rink floor in a 10-foot x 10-foot grid pattern over the entire rink surface.

b. In addition, survey along radii and ends of rink at a 10-foot spacing, 1 foot from edge of perimeter concrete.

2. The information shall be recorded and submitted to the engineer clearly showing the top of concrete elevation in reference to the benchmark used to build the rink floor and the difference between the two elevations. The survey shall be completed the same day as the rink pour and according to ASTM and ACI standards.

E. Curing: After finishing and as soon as possible provide a wet cure for a minimum of 14 days by covering the entire surface with curing blankets. The curing blankets shall be installed to prevent air pockets and discoloration in the concrete surface. The Contractor is responsible for maintaining the wet condition for the entire 14 days. The curling blankets shall be removed all at one time to avoid potential damage due to differential shrinkage. Approved manufacturers: Ultra Cure by McTech Group, Hydrocure by PNA Construction Technologies or equal. Polyethylene sheeting is not approved.

F. The concrete floor shall not be refrigerated or open to equipment traffic for 28 days from time of pour. See startup procedures in the Ice Rink General Requirements Section.

## 3.13 TEMPERATURE SENSORS

A. Install temperature sensors in accordance with manufacturer's recommendations. Sub-soil temperature sensor shall be installed to 1'-6" depth to bottom of sensor. For each sensor, the top of the box cover shall be even with the top of the ice rink slab for easy access and sensor replacement.

## 3.14 CONCRETE PATCHING AND REPAIR MORTAR

A. Clean area: Flush area with clean water to remove all dust. Apply a pH indicator to prepare surface to test for carbonation. Air blasts with oil-free compressed air to remove all water.

B. Prepare, mix and apply per manufacturers requirements.

C. Prevent moisture loss during the first 3 hours after placement by using plastic sheeting.

D. Grind patch flush with existing floor.

## 3.15 CLEANING

A. The ice rink floor shall be completely cleaned of all debris, spills, stains, etc. If requested by the Engineer, the contractor shall wash and mop the entire floor to assure the floor is clean.

B. Clean all other material, equipment, and debris from other areas of the building on a daily basis and thoroughly clean at the end of the project.

**END OF SECTION**

## SECTION 13 18 14 - ICE RINK PIPING, VALVES AND ACCESSORIES

### PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pipe and Fittings.

B. Valves and Accessories.

C. Pipe Hangers.

D. Pipe and Equipment Markers.

E. Pressure Gauges.

F. Thermometers.

G. Insulation.

H. Sealing and Firestopping.

1.2 RELATED SECTIONS

A. Division 0, Division 1, General and Supplementary Conditions.

B. Section 131811 - Ice Rink General Requirements.

C. Section 131812 - Ice Rink Refrigeration System.

D. Section 131813 - Ice Rink Floor.

E. Section 131815 - Ice Rink Waste Heat Recovery Systems.

F. Section 131817 – Ice Rink Central Control System.

1.3 SUBMITTALS

A. Shop Drawings. All submittals shall conform to the requirements of the General Conditions and Section 131811 - Ice Rink General Requirements.

1.4 WARRANTY/GUARANTY

A. As required in Section 131811 - Ice Rink General Requirements.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING REQUIREMENTS

A. As required in Section 131811 - Ice Rink General Requirements.

## PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Polyethylene.

1. Rink pipe and transmission mains. As specified in Section 131813 – Ice Rink Floor.

B. Steel.

1. Primary and secondary refrigerant piping.

2. Material shall be carbon steel and meet the following:

a. Smaller than 1 ½ inches diameter shall conform to ASTM A106, Grade B, Schedule 80. Schedule 40 steel may be used for R-22 liquid refrigerant lines for piping sizes 6 inches and smaller and R-717 refrigerant liquid lines 2 inches through 6 inches and all suction and discharge line 6 inches and smaller and rink piping for steel rink floors.

b. 1 3/4 inch to 12 inches diameter shall conform to ASTM A53, Grade B Schedule 40.

c. Larger than 12 inches diameter shall conform to ASTM A53, Grade B Schedule 40.

d. Type F steel shall not be used for refrigerant lines except when discharging to atmosphere.

3. Joints shall be welded end type. No threaded joints.

4. Fittings shall be carbon steel with welded end type and shall meet ANSI B16.9. Fittings shall be manufactured and not shop or field fabricated.

5. Flanges shall be of the same material as the pipe and shall be rated for a minimum of 150 psi. Shall meet ANSI B16.5

2.2 VALVES AND ACCESSORIES

A. Secondary Refrigerant Valves and Accessories.

1. Approved Manufacturers: Apollo, Aurora, Bell & Gossett, Crane, Flowseal, Milwaukee, Mueller, Nibco, Stockham or equal.

2. Minimum working pressure rating: 125 psig

3. Provide valve neck extensions where needed.

4. Butterfly Valves: Cast iron body with stainless steel shaft; Teflon (PTFE), nylatron, or acetal bearings; EPDM resilient seat.

5. Check Valves: Non-slam design; cast iron body, bonnet, disc plate, and disc cage meeting ASTM A-126 Class B.

6. Combination Valves: Operates as a non-slam check valve, shutoff valve and throttling valve. Cast iron body, brass seat, and bronze disc with EDPM seat insert, stainless steel stem and spring, Teflon-graphite packing.

7. Ball Valves: Bronze body, 316 stainless-steel ball, Teflon seats.

8. Air Release Valves: Cast iron or bronze body. Provide ball valve and drain line to floor. Include 1/2" FPT and 3/4" MPT connections.

9. 3-Way Mixing Valves: Cast iron body, flanged. Controls to operate valve based on fluid temperature.

10. Poly to Steel Transition Fittings:

    a. Approved manufacturers: Krausz USA (Hymax Cplg), Polycam

11. Suction Diffuser/Strainer:

    a. Body and Cover: Cast iron, ASTM A48, flanged.

    b. Vanes & Orifice Cyl: Steel for glycol systems

    c. Stainless steel for calcium chloride systems.

    d. Strainer: 5/32” perforated, 304 stainless steel.

    e. Start-up Screen: 20 mesh, 304 stainless steel.

    f. O-ring: Buna-N

    g. Purge/Drain Plug: Wrought steel

    h. Cap Screws: Wrought steel, SAE Grade 5

    i. Pipe Supports: Steel, adjustable

12. Flexible Connectors: 150 lb plate or carbon steel - flat face type, flexible stainless-steel hose and braid material, and stainless-steel braid collar.

13. Flow Switch or Differential Pressure Switch:

    a. Approved manufacturers: Johnson Controls, United Electric Controls, Hansen, IFM, or equal.

    b. Must be compatible with the system fluid.

    c. Gold-plated contacts for improved electrical performance.

    d. Stainless steel paddle or opposing metal bellows (seal bellows) to detect pressure differences between two sources.

    e. Adjustable set points.

    f. Epoxy coated enclosure.

14. Resistance Temperature Detectors (RTD) Assemblies:

    a. Approved manufactures: Omega, JW Instruments (763.784.5708) or equal.

    b. RTD: Single Element, platinum, 3 wire, Tolerance Class A, 316 stainless steel sheath. Length to be at approximately 10% longer than radius of pipe.

    c. Temperature Ranges:

        1) Return brine/glycol: 0-50F

2) Others: As required.

d. Spring loaded.

e. NPT stainless steel hex nipple.

f. Aluminum screw cover head – NEMA 4X rated.

g. Signal: 4 to 20 mA programmable temperature transmitter, upscale burnout, temperature range to match RTD.

h. Thermowell: Shall be standard duty threaded (NPT), 304 stainless steel, NPT size as required to accommodate RTD.

i. Shall coordinate type of RTD and transmitter with controls, VFD or other device that is being connected to RTD Assembly.

B. Valve Tags

1. Provide non-ferrous metal or plastic laminated tags on each valve with non-ferrous or corrosion proof fasteners. Numbering system shall be referenced in the Operation and Maintenance Manual.

## 2.3 PIPE HANGERS

A. Approved Manufacturers: Anvil International, Crane, Red Head, or equal.

B. Provide a complete pipe support system including hangers, supports, brackets, guides and anchors even if not specifically shown on the drawings. All supports shall conform to the latest requirements of ASME Code for Pressure Piping B31.1 and MSS Standard Practice SP-58, SP-69, SP-89 and SP-90.

C. Pipe hangers shall be capable of supporting the pipe in all conditions of operation without transferring excessive stress to the pipe.

D. Supports shall fit adequately over insulation. Provide 12 gage pipe saddles and inserts of high-density block insulation.

E. Exterior pipe supports shall be galvanized steel.

## 2.4 PIPE AND EQUIPMENT MARKERS

A. All pipe and equipment markers shall conform to IIAR Bulletin No. 114 (most recent edition): Guidelines for Identification of Ammonia Refrigeration Piping and System Components.

All exposed piping shall be marked with name of fluid be conveyed and direction of flow. Markers shall be clearly visible and shall conform to ANSI and OSHA requirements for marker size, marker color, legend size, and legend color. Install at least three (3) markers for each pipe in each room.

B. Label all pipe in ice equipment room over 1.5 inches in diameter.

C. Label all equipment on nearest pipe (e.g., Pump 1, Compressor 1, Chiller, Snow Melt Heat Exchanger, etc.)

## 2.5 PRESSURE GAUGES

A. Approved Manufacturers: McDaniel, Ashcroft or equal.

B. Materials and Accessories: Shall have stainless steel case, minimum 4" diameter, bourdon tube type, liquid filled, 1% scale accuracy over entire range of gauge, 1/2" minimum diameter stainless steel sockets. Provide ball valve and snubber for each gauge. Provide 1/2" minimum diameter steel pipe extension to extend ball valve outside of pipe insulation. Steel pipe and ball valve specified elsewhere in the specifications.

C. Sizes: Scaled from 0 to 50 psi for snowmelt, sub-floor, and water systems. Scaled from 0 to 100 psi for all other systems

2.6 THERMOMETERS

A. Approved Manufacturers: Weksler, Trerice or equal.

B. Materials. Round, bimetal thermometer style using bimetallic sensing element, sensing element consisting of two dissimilar metals, stainless steel stem, highly polished type 300 stainless 4" diameter steel case, adjustable angle, silicone dampened coil, dial pointer, stainless steel stems, non-breakable double strength glass window, accuracy to +/- 1.0% full scale ASME B40.3 Grade A, external reset.

C. Materials: Adjustable base, plastic case, non-breakable window, accuracy of one scale division. Temperature wells to have copper bulbs.

D. Size: 9" long, scale ranging from -40 F to 110 F.

2.7 INSULATION

A. Pipe and equipment insulation system.

B. See Insulation Schedule on drawings for required thickness, type and location.

C. Insulation and Jacket Type:

1. Materials: Shall be composite insulation system including insulation, jacket (as specified for specific application), and all sealants and shall have a flame spread rating of 25 or less and a smoke development rating of 50 or less. Shall be puncture resistant based on ASTM D-781, moisture and mildew resistant and vermin proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.

2. Type 3 Insulation (exposed, interior of building) - Flexible Elastomeric Thermal Pipe Insulation by Armaflex or equal.

a. Jacketing: None.

3. Type 5 Insulation (exposed, interior and exterior of building) – Dow XPS Styrofoam, Certainteed, Ownes-Corning, Pittsburgh Corning, Extrol, Fibrex, H.B. Fuller, or equal.

a. Insulation shall meet the following properties:

| **Properties** | **Value** |
|---|---|
| Density, ASTM D1622, minimum | 1.6 lbs/cf |
| Compressive Strength ASTM D1621, minimum | 20 lb/sq. in |
| K-factor, ASTM C518 | 0.259 btu-in/hr-cf-F |
| Water Absorption, % by volume ASTM C272/D2842, max. | 0.5/1.0 % |
| Water Vapor Permeability, ASTM E96, max. | 1.5 perm-inch |

b. Jacketing (exposed, interior of building):

1) PVC material with thickness of 20 mils, gloss finish on one side, semi-gloss on other side, FS LP-535D. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation or installed outdoors. Jackets shall be

rated for 0 F to 150 F with maximum flame spread rating of 25 meeting ASTM E-84 and maximum smoke development rating of 50 meeting ASTM E-84.

2) Type: Composition A, Type II, Grade GU, jacketing shall meet above requirements. Type 3 jacketing shall meet ASTM D-1784, Grade 1, and high impact in addition to the above requirements.

c. Jacketing (exposed, exterior of building and vertical pipe chase applications):

1) Aluminum material alloy 3003, 1100, or 3105 meeting ASTM B-209 with H-14 temper, 20 mil, smooth finish, white painted aluminum. UV protected. Jacketing shall have no paper to retain moisture.

2) Provide Polysurlyn moisture barrier with a minimum thickness of 2.5 mil. Dupont, Dow Saran or equal.

3) Banding shall be 0.020" thick by ½" wide, 300 series, stainless steel.

4) Aluminum jacketing for fittings, tees, elbows, valves, caps, etc. shall be sectional, factory contoured, to fit closely around insulation.

4. Type 5A (direct bury interior and exterior applications) – FoamGlas by Owens Corning or equal.

a. Insulation shall meet the following properties:

| **Properties** | **Value** |
|---|---|
| Density, ASTM C303, minimum | 7.18 lbs/cf |
| Compressive Strength C165/C240/C552, minimum | 90 lb/sq. in |
| K-factor, ASTM C518, C177 at 0F | 0.250 btu-in/hr-cf-F |
| Water Absorption, % by volume ASTM C240, max. | < 0.2% by Vol |
| Water Vapor Permeability, ASTM E 96 West Cup, max. | 0.0 perm-inch |

b. Jacketing:

1) Approved manufacturers: Pittwrap SS by Pittsburgh Corning or equal. Insulrap 50-SJ-NG is not considered an equal.

2) Modified bituminous membrane

3) Self-healing material

4) Overlap shall be a minimum of 50%.

5) Apply in temperatures above 50F.

6) Properties:

| **Properties** | **Value** |
|---|---|
| Thickness (mils), minimum | 70 |
| Permeability, ASTM E96 (perm-inches), max. | .002 |
| Tensile Strength, ASTM D882 (at 78F), min. | >1150 lbs/in |
| Puncture Resistant, ASTM E154, min. | 199 lbs |

5. Type 5B (direct bury interior and exterior applications) Composite Piping System

a. This **product is can only be used with composite piping systems with HDPE jacket** such as Tricon Piping Systems, Inc., Energy Task Force Pre-Insulated Pipe or equal. Piping material shall meet the pipe specifications for this project. Shall use HDPE jacket as specified below.

b. Closed cell polyurethane foam insulation. Foamed in place.

c. Insulation shall meet the following properties:

| Properties | Value |
|---|---|
| Density, ASTM D1622, minimum | 2.0 lbs/cf |
| Closed Cell, minimum | 90-95% |
| K-factor, ASTM C177 | 0.147 btu-in/hr-sf-F |

d. Jacketing

1) Direct Bury, Interior and Exterior of Building for Composite Piping Systems:

2) Approved manufacturers: Tricon Piping Systems, Inc. or equal.

3) HDPE materials.

4) Must be applied with manufacturers recommended shrink sleeve material connecting pipe section for waterproof application. No substitutions.

5) Properties:

| Properties | Value |
|---|---|
| Resin, ASTM D3350 | Type III, Grade P34 |
| Tensile Strength, ASTM D638(at 78F), min. | 3300 psi |
| Ultimate Elongation, ASTM D638 min. | 850% |
| Tangent Flexural Modules, ASTM D790, min. | 175,000 psi |

D. Insulation Inserts and Pipe Shields

1. Approved Manufacturers: B-Line, Pipe Shields, Value Engineered Products or equal.

2. 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 a minimum 180 degrees coverage on bottom supported piping and full 360 degrees coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide additional load distribution steel plate. 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.

3. Where contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thickness, gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered/pre-manufactured product described above.

4. Precompressed 20 lb density molded fiberglass blocks, Hamfab or equal, of the same thickness as adjacent insulation may be substituted for calcium silicate inserts with a 1” x 6” block for piping through 2 ½” and three 1” x 6” blocks for piping through 4”. Submit shield schedule to demonstrate equivalency to pre-engineered/pre-manufactured product described above.

5. Wood blocks will not be accepted.

E. Accessories:

1. Provide all adhesive, sealants, protective finishes, and other products as recommended by the manufacturer to provide a completely sealed system.

2. Provide vapor barrier that is non-flammable, fire resistant and polymeric resin, for all systems operating below 65 F.

3. Insulation bands shall be ¾ inches wide, constructed of aluminum or stainless steel. Minimum thickness to be 0.015 inches for aluminum and 0.010 inches for stainless steel.

4. Tack fasteners shall be stainless steel ring grooved shank tacks.

5. Staples shall be clinch style.

6. Insulating cement shall meet ANSI/ASTM C195, hydraulic setting mineral wool. Finishing cement shall meet ASTM C449.

7. Bedding compounds to be non-flammable, fire resistant, polymeric resin.

2.8 SEALANT AND FIRESTOPPING

A. Sealant and fire stopping of sleeves and openings between ductwork, piping, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor.

B. Fire and/or Smoke Rated Penetrations:

1. Approved Manufacturers: 3M, Hilti, Rectorseal, STI/SpecSeal, Tremco, or equal.

2. All fire stopping systems shall be provided by the same manufacturer.

3. Fire stop systems shall be UL listed or tested by and independent testing laboratory approved by the State.

4. Use a product that has a rating not less than the rating of the wall or floor being penetrated.

5. Contractor shall use firestop putty, caulk sealant, intumescent wrap strips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application require for this project. Provide mineral wool backing where specified in manufacturer's application detail.

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 cored opening or a water-stop type 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 insulation and sleeve.

**PART 3 - EXECUTION**

3.1 EXCAVATION, INSTALLATION OF PIPE, AND BACKFILLING

A. The Contractor shall be responsible for verifying the location of all existing piping, electrical, and other utilities prior to excavation.

B. No changes to pipe alignment or elevation shall be made without approval from the Engineer.

C. All pipes shall be cleaned out prior to installation. Inspect pipe for defects and damage.

D. Decrease line size to pumps as required with long radius reducing elbows or concentric reducers/increasers in vertical piping. All valves and piping specialties must be full line size.

E. Excavate pipe trenches in accordance with OSHA regulations. All pipe trenches shall be backfilled as soon as possible. Backfill and compact materials in 12" lifts. Care shall be taken while backfilling to protect the

pipe from damage. Backfill material for trenches within the building footprint or other structural areas shall be compacted to at least 100% standard moisture density relationship of soils to prevent settlement of the floor slabs.

F. Support all piping in such a manner as to prevent all vibration and vertical or horizontal movement. All pipe support systems shall be installed to meet local and state code requirements.

G. Provide all coring drilling required to install piping system through masonry or concrete walls, screen walls, roof structures and other structures as required to install piping systems. Keep holes to minimal size.

H. Provide all pipe sleeves required for core drilled penetrations.

I. Relief lines and devices shall be terminated outside of the building in accordance with all current State and Local codes including minimum distance from ground level, openings and exits unless a containment tank is specified.

J. All refrigerant piping shall be installed, tested and placed in operation per these specifications and the state and local mechanical codes.

K. All pipe joints erected on site shall be exposed for visual inspection prior to being covered.

## 3.2 TESTING OF PIPING SYSTEMS

A. All testing shall be witnessed by the Engineer. Provide advanced notification to the Engineer as specified in Section 131811 - Ice Rink General Requirements.

B. All piping shall be tested prior to backfilling. Isolate all equipment and any other devices that may be damaged by the pressure test. Testing procedures shall meet all code requirements.

C. Testing Requirements:

1. Polyethylene Pipe: Shall be tested as specified in Section 131813 -Ice Rink Floor.

2. Steel Brine Pipe: Shall be hydrostatically tested at 75 psig for 24 hours with no pressure drop.

3. Gauges used for pressure tests must be designed for pressures greater than the test pressure. For example, a 100-psi gauge cannot be used for a 100-psi test. The scale on the gauge must be the next increment up from 100 psi.

## 3.3 CHARGING OF SYSTEMS

A. Secondary Refrigerant Systems: After all pressure tests have passed the secondary refrigerant systems shall be fully charged with the specified solutions. Remove all air from the systems.

## 3.4 VALVES AND ACCESSORIES

A. Install valves at the locations shown on the drawings, described in the specifications as required for system operation and maintenance or as required by the manufacturer.

B. Install all valves so that they can be easily replaced in the future including installing unions and allowing adequate clearance.

C. Install purges and servicing valves on the systems as needed for operating and servicing the system.

D. Install all valves with adequate clearance around the valve for maintenance.

E. Install air release valves at all high points in the system whether or not shown on the drawings.

F. All pressure relief valves shall be located where ambient temperature is normally above 32 F. Pipe all pressure relief piping to within one foot of ice equipment room floor.

G. Install valves for system drainage at all exposed low points in the system whether or not shown on the drawings.

H. Provide all power and electrical systems as necessary for operation.

I. Construction strainers in suction diffusers shall be removed after system start-up.

J. Install thermowells for all temperature gauges.

K. Resistance Temperature Detector (RTD) Assemblies

1. Piping system shall be drained and fluid stored for installation of threadolets to install wells and RTD probes. No hot taps allowed.

2. For new projects, installation shall be done prior to installation of insulation systems. For renovation projects, remove pipe insulation as necessary for installation of wells and sensors. Reinsulate piping system with like materials to provide a sealed insulation system.

3. Wire sensors directly to VFD's or other devices.

4. Refill piping systems. Provide additional fluid as necessary for full system charge. Remove air from system.

L. 30 days after start-up the following shall be performed on the system:

1. Replace filter dryer cores.

2. Clean screens on pumps, strainers and other equipment.

## 3.5 GAUGES AND THERMOMETERS

A. All gauges and thermometers shall be installed at eye level wherever possible unless specified otherwise and shall be positioned for ease of reading by operation and maintenance staff. All gauges and thermometers shall be calibrated per the manufacturer's recommendations prior to installation

## 3.6 HANGERS AND SUPPORTS

A. The Contractor is responsible for adequately supporting all piping systems and equipment with hangers, floor supports, framing systems and all other components required to adequately support the piping systems and equipment. If supported from the ceiling, the Contractor shall verify that the building structure can support the total weight of all piping and equipment systems where hangers and supports are installed unless otherwise noted on the drawings. If requested, the contractor shall provide calculations, by a registered engineer, to verify construction of hangers and supports is adequate including the building structure they are attached to.

B. Support all piping in such a manner as to prevent all vibration and vertical or horizontal movement.

C. Pipe hangers and supports shall be spaced no more than eight (8) feet on center. Provide additional supports by equipment for assistance with equipment maintenance and replacement. Provide sufficient supports near equipment so that temporary supports are not needed to remove and replace equipment or to service and maintain equipment.

D. All ground supports shall be located so that equipment, valves, etc. are fully accessible for easy maintenance and supports shall not impede the walkways.

3.7 INSULATION AND JACKETS

A. Furnish and install insulation and jacketing on equipment and piping as noted on the drawings and all other cold surfaces which are part of the system including, but not limited to, chilled water pump bodies, chilled water filter, chemical bypass feeder, etc.

B. Systems shall not be insulated until an inspection has been completed by the Engineer and pressure tests have been performed and accepted.

C. All valves, fittings, and accessories connected to pipe and equipment systems shall be insulated and jacketed. Provide handle extensions as required to allow full insulation of valves.

D. Provide vapor barrier for all systems operating below 65 F.

E. Install all insulation and jacketing per manufacturer's recommendations. Use full length materials. 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 or supports maybe attached directly to piping with insulation completely covering hanger or support and jacket sealed at support rod penetrations. Where riser clamps are required to be attached directly to piping requiring a vapor barrier, extend insulation and vapor barrier jacketing/coating around riser clamp.

F. Install all jacketing on exposed exterior piping systems with joints at 3’oclock and 9 o’clock position and jacketing secured with specified banding and seals. Banding shall be installed at a maximum of 9” on center. End joints shall be secured with bands and seals centered directly over joint. Jacketing shall be installed in a manner to shed water and in accordance with the Midwest insulation Contractors Association (M.I.C.A) National Commercial and Industrial Standards. Jacketing shall be caulked before closing and banding and positioned in an orientation to avoid water infiltration.

G. All insulation joints shall be staggered and tight. Provide 2” minimum lap on jackets and 2” tape on butt joints, firmly and continuously cemented with lap adhesive or welding solvent as recommended by the manufacturer. Additionally, secure with staples along seams and butt joints. Coat staples with vapor barrier mastic on systems requiring vapor barrier.

H. Provide inserts and pipe shields at all hanger and support locations. Inserts may be omitted on ¾” and smaller copper piping provided 12” long 22-gauge pipe shields are used.

I. Insulate entire piping system for a completely insulated system including all areas that will frost up during operation. This includes filling all gaps, spaces, voids, etc. completely to prevent frost or condensation build up. This also includes providing valve handle extensions and all other material to properly insulate valves and prevent condensation. Insulation shall be tightly butted and free of voids and gaps. Weather seal shall be continuous.

J. All fasteners and bands shall be neatly aligned, and overall work must be of high-quality appearance and workmanship.

K. Provide removable insulated covers for fill valves, equipment lifting hooks, access points to strainers, valves, nameplates, and all other areas that require periodic inspection, service or repair.

L. All site glasses and nameplates shall be insulated to prevent frost build-up.

M. Provide all adhesive, sealants and other products as required by the manufacturer to provide a completely sealed system. Seal all seams of the jacketing.

3.8 SEALING AND FIRESTOPPING

A. All pipes piercing interior and exterior walls, ceiling, and floor shall be tightly sealed to the walls, ceiling and floors through which they pass as specified herein.

1. Fire and/or Smoke Rated Penetrations. Install approved product in accordance with the manufacturer's instructions where pipes penetrate a fire/smoke rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier. 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 any substantial weight.

2. Non-Rated Penetrations. 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 and cored opening and the pipe or insulation is completely blocked.

3.9 PAINTING AND FINISHES

A. All interior steel piping, equipment, fittings, supports, and accessories that are exposed to view shall be painted with one coat of primer and one coat of enamel. Ammonia piping colors per IIAR Bulletin No. 114 March 2017. Prepare steel as recommended by the paint manufacturer. Colors shall be as outlined in table below:

| **Area or item** | **Color** |
|---|---|
| Ammonia high pressure liquid lines | Orange (Pantone 152 C) |
| Ammonia high pressure vapor lines | Yellow (Pantone 109C) |
| Ammonia low pressure/high temperature liq. & vapor lines (0F to +47.3F) | Light blue (Pantone 298C) |
| Ammonia low pressure/low temperature liq.&vapor lines | Dark blue (Pantone 3015C) |
| Pressure relief vent piping | Grey (Pantone 430C) |
| Other refrigerant piping and vessels | Color selected by Owner |
| Condenser water piping (refrigerant piping specified above) | Color selected by Owner |
| Interior supports and frames in refrigeration room | Color selected by Owner |
| All other areas not mentioned | Color selected by Owner |

B. All exterior exposed steel piping shall be painted with one coat of primer and two coats of enamel. Prepare steel as recommend by the paint manufacturer. Owner to select color of paint.

C. Touch up paint on all equipment, vessels, supports and exposed pipes after project is complete.

D. Touch up damaged galvanized coatings and corrosion protection systems on condenser and remote sump.

**END OF SECTION**

# SECTION 21 05 00 - BASIC FIRE PROTECTION REQUIREMENTS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Basic Fire Protection Requirements specifically applicable to Division 21 Sections.
B. Scope of work:
   1. All areas as indicated on the drawings are to be protected by an automatic suppression system, of type as indicated.
C. Contractor shall be responsible for designing the distribution systems and sizing of the systems by hydraulically calculation; and shall provide the necessary engineering drawings and calculations to obtain acceptance of all authorities having jurisdiction.

### 1.2 ADDITIONAL REQUIREMENTS

A. The General Conditions, the Supplementary General Conditions and Division 1 shall govern work under Division 21, in addition to these Basic Fire Protection Requirements.
B. Fire Protection Contractor shall be licensed by the State of Wisconsin to furnish and install fire protection systems.
C. Contractor shall obtain all necessary permits and licenses pertaining to this Division (expense borne by the Contractor) and comply with Municipal and State Codes, Laws, Ordinances and Regulations, and the requirements of the National Fire Protection Association, and pay all fees and sales taxes as required, and post all bonds incident thereto.

### 1.3 DEFINITIONS

A. "Piping" includes all pipe, fittings, valves, hangers, and other supports and accessories related to such piping.
B. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, in crawl spaces or buried.
C. "Exposed" means not installed underground or "concealed" as defined above.
D. "Fire Protection Work" is all of the work in Division 21.
E. "Contractor" means the Contractor or Subcontractor performing the required work of their respective Divisions.
F. "Or equivalent" means to possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity.
G. "Provide" means the Contractor shall "furnish and install" work and/or equipment.
H. "FPC" means the Fire Protection Contractor.

### 1.4 SUBMITTALS

A. Contractor shall review and certify shop drawings are in compliance with contract documents.
B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
C. Mark dimensions and values in units to match those specified.
D. Engineer's review of Shop Drawings shall not relieve Contractor from the responsibility for any variation from the Contract Documents unless the Contractor has in writing called the Engineer's attention to each such variation at the time of submission and the Engineer has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing review notes; nor shall any review by the Engineer relieve the Contractor from responsibility for having complied with the provisions of the contract, or from responsibility for errors or omissions in the shop drawings.

E. Physical dimension of shop drawings submitted for review shall not exceed 8-1/2" x 11" unless impossible to illustrate data properly without using a larger sheet.
F. Submit shop drawings of the following review:
   1. All valves.
   2. Alarm and supervisory devices.
   3. Sprinkler heads.
   4. Pipe and fittings.
G. Drawings indicating new fire protection systems as to be installed with pipe sizes, etc.; and copy of systems hydraulic calculations shall be submitted to the following for review:
   1. Number of prints, as required to: Local fire department.
   2. Number of prints, as required to: Owner's insurance carrier.
   3. Number of prints, as required to: Applicable State agency (DSPS or DHS).
H. Any work installed prior to returned comments of review plans, and is found to require change, shall be changed at this Contractor's expense; including any adjustment to any systems of other trades already installed.
J. Electronic submittal process:
   1. Contractor shall provide engineer with one paper or electronic copy of the submittal for review.
   2. Contractor shall submit and notify engineer of electronic shop drawing posting to the project web site with information matching the paper copy.
   3. Engineer will review the paper or electronic submittal and provide electronic shop drawing review response. Response will be posted on project web site.

## 1.5 SUBSTITUTIONS

A. Contractor shall provide all supporting data and assume the "burden of proof' that any substitute proposed is "equivalent' as to appearance, construction, capacity and performance. The judgment of equivalency shall be made by the Engineer at the time of shop drawing review, not during bidding.
B. Where substitute equipment is accepted and use of such equipment shall require any redesign of structure, foundations, utilities, piping, wiring or of any other part of the architectural, structural, mechanical, sanitary or electrical work, the cost of all such redesign, drawings, detailing and accompanying additional costs of any item of the work shall be paid for by the Contractor. Redesign shall be subject to the approval of all authorities having jurisdiction over the work including the Architect/ Engineer.
C. Contractor shall provide ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit and any other additional materials and equipment required by the system due to accepting equipment substitutions at no additional cost to the Owner.

## 1.6 GUARANTEES AND WARRANTIES

A. Contractor shall guarantee, in writing, that all work installed shall be free from any and all defects in workmanship and materials; that all apparatus shall develop capacities and characteristics specified; and that if, during the period of one year, or as otherwise specified, from the date of substantial completion, any defects in workmanship, material or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within a reasonable time as specified in notice from the Owner's Representative. In default thereof, the Owner's Representative shall have the work done and charge the cost of the work to the Contractor.
B. Furnish manufacturers written warranties for all equipment, stating effective date of Warranty, to the Owner's Representative.

## 1.7 MATERIALS

A. All materials shall be new, of best quality and grade, UL approved and in strict accordance with the specification requirements.

B. All systems components shall be rated for the maximum working pressure to which they are exposed, but not less than 175 psi.
C. Similar component items shall be by the same manufacturer, such as:
   1. Hangers and supports.
   2. Control and isolation valves.
   3. Drain valves.
   4. Sprinkler heads.

## 1.8 STORAGE OF EQUIPMENT AND MATERIALS

A. Materials shall be so stored as to insure preservation of their quality and fitness for the project.
B. When considered necessary, the equipment and materials shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground, and they shall be placed under cover.
C. Stored materials shall be located to facilitate prompt inspection.
D. Equipment and materials shall be stored in approved locations and in such a manner as to prevent overloading of the building structure.

## 1.9 PIPE PROTECTION

A. Open ends of all pipes must be effectively closed and kept closed during construction.

## 1.10 RUBBISH REMOVAL

A. See “Division 1".
B. As directed by Owner’s representative, during progress of work at completion, remove rubbish, protection, dirt, debris, tools, equipment and unused materials from building and site and leave building premises in a clean, orderly condition.

## 1.11 COOPERATION WITH OTHER TRADES

A. Contractor shall give full cooperation to other trades and furnish any information necessary to permit the work of all trades to be installed satisfactory and with least possible interference or delay.
B. Where the work of the Contractor shall be installed in close proximity to the work of other trades, or where there is evidence that the work of the Contractor shall interfere with work of other trades, the Contractor shall assist in working out space conditions to make a satisfactory adjustment.
C. If the Contractor installs work before coordinating it with other trades, or so as to cause interference with work of other trades, this Contractor shall make necessary changes in the work to correct the condition without extra charges.

## 1.12 PROTECTION OF FINISHED WORK

A. Contractor shall continuously maintain adequate protection of all his work and materials, whether worked or in worked on or off site of the project and shall protect the work and material of all the other Contractors and the existing property from injury arising in connection with their contracts.
B. All damages of each and every kind resulting from neglect or refusal of the Contractor to protect the work and materials and property during erection, construction and completion of the project shall be made good by him.
C. Whenever damage or destruction of property of any character resulting from neglect, misconduct, or omission due to the manner of the method of execution or non-execution of the work or caused by defective work or the use of improper materials, the Contractor shall be held responsible until the work has been corrected, completed and complied with.

## 1.13 REPAIRS

A. See “Division 1".
B. This contractor shall make good and pay for glass breakage, plaster patching and repairs to all finished work, existing or new caused by this Contractor’s work.

## 1.14 CUTTING AND PATCHING

A. This Contractor shall be responsible for establishing sizes and locations of all openings and lintels in new work and to transmit this information to the Contractor whose work is involved at such time as to avoid cutting and patching.
B. All patching shall match adjacent surfaces.
C. Contractor shall inspect and take note of existing conditions along with the Owner's Representative to avoid later disputes with regard to the condition of the existing surface before work began.
D. Openings through existing concrete shall be core-drilled or saw cut.

## 1.15 OPENING AND SLEEVES

A. Provide openings as necessary to permit installation of piping or any other part of work under this Division.
B. Provide sleeves for all piping penetrating floor and masonry walls.

## 1.16 JURISDICTION OF WORK

A. The event of jurisdiction (as to whether the work is to be installed by another trade or subcontractor) shall not release the work from this Contract. In such occurrence, the original contractor shall sublet the work to the trade or subcontractor having jurisdiction.
B. The trade or subcontractor having jurisdiction shall perform the work in conformance with these drawings and specifications.

## 1.17 OPERATING INSTRUCTIONS

A. Contractor shall, upon completion of all work and of all tests, furnish the necessary skilled, qualified personnel for operating the system during times agreed to by the Owner's representative.
B. During this period, instruct the Owner’s representatives fully in the operation, adjustment and maintenance of all equipment furnished.
C. Give at least forty-eight (48) hours’ notice to the Owner's representative in advance of this period.
D. Contractor shall maintain a record of operating instruction periods, documenting the date, time involved, people in attendance and have the Owner's representative attest in writing for each session held; only documented and signed records shall be used to show compliance to the specified instruction periods.

## 1.18 ELECTRICAL WORK

A. This Contractor shall furnish and install all alarm and tamper switches, flow indicator switches. All devices shall be 110 VAC; if voltage requirement is lower than 110 VAC for any of this equipment, this Contractor shall be responsible for providing the necessary transformers.
B. Electrical Contractor is responsible to wire from the fire suppression systems components to the building system and installing and wiring of any transformers required.

## 1.19 FIRE PROTECTION DOCUMENTATION AVAILABILITY

A. Electronic files and transfer:
   1. The Fire Protection contractor may obtain electronic Fire Protection building design model information for contractor development of the construction model.
   2. Fire Protection electronic design information will be available via electronic transfer or posted to project http site upon request of client.
   3. Design model information available will contain 2-D ACAD, 3-D ACAD or 3-D Revit based information to generate the Fire Protection building modeling drawings from the Engineer.
   4. The architectural electronic building design drawing information must be obtained from the Architect.

**1.20 TESTS AND INSPECTIONS**

A. Contractor shall be responsible for testing and certification of systems and ordering inspections as required by authorities having jurisdiction.
B. All tests shall be conducted in the presence of and to the satisfaction of the Owner or an authorized representative.
C. Inspections shall be made by the Owner's authorized representative and inspectors having jurisdiction.

**1.21 CLEANING**

A. After all tests have been made and the systems pronounced to be satisfactory, the Contractor shall go over all work and clean equipment, fixtures, and related appurtenances and piping, and leave them clean and in complete working order at final completion of the project.

**1.22 COORDINATION DRAWINGS**

A. See Division 1.

**1.23 RECORD DRAWINGS**

A. Refer to Division 1.

**1.24 MAINTENANCE MANUAL**

A. Refer to Division 1.

**1.25 SITE VISIT**

A. Contractor shall visit job site and become familiar with existing conditions prior to starting work.

**PART 2 PRODUCTS**

**2.1 ACCESS PANELS**

A. Manufacturers:
   1. Milcor.
   2. Knapp.
   3. Zurn.
B. Panels shall be of adequate size to permit adjustment or service of concealed devices.
C. Panel design shall be suitable for installation in the material forming the finished surface.

D. Panels in masonry or plaster surfaces shall have a flush metal frame and flush, hinged steel door with flush latch. Latches shall be key operated cylinder lock or screwdriver operated.
E. Panels in acoustic ceiling shall be recessed type, to which tile can be attached flush with the ceiling tile.
F. Panels shall be UL listed to conform to the fire rating of the surface it is installed in.

## 2.2 FIRESTOP MATERIALS

A. Manufacturers:
   1. 3M.
   2. Insta-Foam Products.
   3. Dow Corning.
   4. Nelson Firestop Products.
B. One-part, intumescent elastomer, non-corrosive to metal, and compatible with synthetic cable jackets.
C. Material shall expand up to 10 times when exposed to flame or heat.
D. UL classified.
E. Maximum flame spread and fuel contributed of 25 and smoke development of 50 when testing in accordance with ASTM E84.

# PART 3 EXECUTION

## 3.1 ACCESS PANELS

A. Provide access panels for access to equipment, valves, or other specialties installed behind wall or above ceiling surfaces.
B. Lay-in acoustical tee bar ceilings and snap-in removable metal pan ceilings shall be considered adequate for access.
C. Mechanical Contractor shall sublet installation work to subcontractors specifically skilled in the construction of the surfaces involved.
D. Contractor shall confer with the other Project Contractors with respect to access panel locations and shall, wherever practicable, group devices in such a manner so as to eliminate as many panels as possible.
E. Contractor shall remove all markings and labels from access panels.

## 3.2 FIRESTOP MATERIALS

A. Firestop systems shall be UL listed.
B. Penetrations through fire and/or smoke rated construction shall be sealed to maintain the rating of the construction in which they occur.
C. Comply with the manufacturer's requirements for proper installation of firestop materials to obtain the required fire and/or smoke rating.

## 3.3 OPENINGS AND SLEEVES

A. Provide all openings and set all sleeves in cooperation with Contractors whose work is affected thereby.
B. Caulk opening between pipe and sleeve with 3M FireDam Fire Barrier Sealant, or approved equivalent.
C. In event holes must be provided through reinforced concrete, they must be carefully drilled to avoid spalling and unnecessary damage of weakening of any structural member; chopping or breaking out will not be permitted.
D. Obtain Architect’s approval before providing openings through concrete or masonry in place and then proceed as directed.

E. Contractor shall be responsible for damage to finished work resulting from cutting or drilling required because of neglect of Contractor to provide accurate and sufficient information.
F. Cutting or drilling thru structural beams or joists is not permitted.

### 3.4 SYSTEM INTERRUPTION

A. Prior to interrupting any system operation, Contractor shall obtain approval for the interruption from the Owner and authority having jurisdiction.

END OF SECTION

# SECTION 21 05 29 - SUPPORTS AND ANCHORS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Pipe hangers and supports.
B. Interior wall and floor pipe penetrations.

### 1.2 REFERENCES

A. MSS SP58 - Pipe Hangers and Supports - Materials, Design, Manufacturer, Selection, Application, and Installation.
B. NFPA 13 - Installation of Sprinkler Systems.
C. NFPA 14 - Standpipe and Hose Systems.
D. UL - Fire Resistance Directory.

### 1.3 SUBMITTALS

A. Product Data: Schedule of all hanger and support devices indicating shields, attachment methods and type of device for each pipe size and type of service.
B. Manufacturer's catalog data for all prefabricated pipe penetrations.
C. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

### 1.4 QUALITY ASSURANCE

A. Conform to applicable code for support of piping.

## PART 2 PRODUCTS

### 2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Grinnell.
   2. B-Line.
   3. Michigan Hanger.
   4. Uni Strut.
   5. Fee & Mason.
B. Conform to ASME B31.9 MSS SP-58.
C. Hangers:
   1. For pipe sizes 4 inches and under: Carbon steel, adjustable swivel ring, or adjustable clevis. MSS SP-58 Type 10 or Type 1.
   2. For pipe sizes 5 inches and over: Carbon steel, adjustable clevis, MSS SP-58 Type 1.
D. Multiple or Trapeze Hangers:
   1. Steel channels with welded spacers and hanger rods.
E. Wall Support:
   1. Pipe sizes 2 inches and under: Carbon steel hook.
   2. Pipe sizes 2-1/2 inches and over: Welded steel bracket and MSS SP-58 Type 32 or 33 and steel clamp.
F. Vertical Support: Steel riser clamp, MSS SP-58 Type 8.
G. Accessories:
   1. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded, black finish with adjusting locknuts.

2. Beam Clamps:
   a. MSS SP-58 Type 23 malleable black iron clamp for attachment to beam flange for use with pipe sizes 4 inches and less. Furnish with a hardened steel cup point set screw.
   b. MSS SP-58 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 but limited in application to pipe sizes 8 inches and less without prior approval.
3. Concrete Inserts:
   a. MSS SP-58 Type 18 wedge type or universal concrete inserts for pipes 8" and under.
   b. Wedge type: 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.
   c. Universal type: Black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8-inch diameter.
   d. Use drilled steel shell with plug type inserts when the inserts are placed after the concrete is poured.
4. 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.
   b. Load rating of 2000 pounds per foot in concrete.
   c. Manufacturer's standard brackets, inserts, and accessories designed for the channel inserts may be used.
   d. Select insert length to accommodate all pipe, duct, and conduit in the area.

H. Powder actuated anchors are not acceptable.

## 2.2 INTERIOR WALL AND FLOOR PIPE SLEEVES

A. Material: 18-gauge galvanized steel or steel pipe.
B. Diameter: One inch larger than outside diameter of the pipe, conduit, or pipe insulation.
C. Length: Sufficient length to pass thru wall or floor. Sleeves in Mechanical Room floors shall extend 6" above finished floor.

# PART 3 EXECUTION

## 3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

## 3.2 INSERTS

A. Provide inserts 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 inches.
D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

## 3.3 PIPE HANGERS AND SUPPORTS

A. Pipe hangers shall be spaced in accordance with the manufacturer’s recommendations and in compliance with NFPA applicable regulations.
B. Install hangers to provide minimum 2-inch space between finished covering and

adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.
D. Use hangers with 1-1/2-inch minimum vertical adjustment.
E. Support vertical piping at every [other] floor.
F. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
G. Support riser piping independently of connected horizontal piping.
H. Design hangers for pipe movement without disengagement of supported pipe.
I. Adjust hangers to obtain the slope specified in the appropriate piping section.
J. Where piping and equipment hangers occur in areas designated to receive spray-on-fireproofing:
    1. Secure all hangers, support members, beam clamps, etc. which is required to support piping and equipment from the framing system designated to receive spray-on fireproofing before the spray-on material is applied.
    2. After the spray-on material is applied, complete the installation of the suspension components, and then install the pipe and equipment.
    3. This Contractor shall be responsible to determine the areas specified to receive spray-on fireproofing and schedule his work accordingly.
    4. This Contractor shall not be allowed to remove any sprayed-on fireproofing material to attach his hangers and supports.

## 3.4 PIPE PENETRATIONS THROUGHT INTERIOR WALLS

A. Piping:
    1. Thru walls where drywall or masonry does not extend to structure: No special requirements.
    2. Thru walls where drywall, concrete, or masonry extends to structure and thru floors:
        a. For new masonry and concrete walls and floors, furnish sleeves to the appropriate Contractor for installation. Provide sleeve layout.
        b. For new fire-rated drywall walls, furnish and install sleeves.
        c. For non-rated drywall walls, no sleeve is required.
        d. For existing masonry walls, provide sleeve and grout sleeve in wall.
        e. Fill void between pipe and wall, floor or sleeve with mineral wool.
        f. Non-rated walls and floors: Caulk both sides with non-hardening caulk.
        g. Rated walls and floors: Seal both sides with UL rated firestop system.
    3. Thru pre-cast deck:
        a. Core-drill hole thru topping and pre-cast deck. No sleeve is required.
        b. Fill void between pipe or insulation and floor with mineral wool.
        c. Seal both sides with UL rated firestop system.
    4. Thru pre-cast deck with waterproof membrane:
        a. Core-drill hole thru pre-cast deck. Furnish and install sleeve to attach top of pre-cast deck. Sleeve shall extend minimum 2" above top of topping and shall be used for attaching membrane and as concrete stop.
        b. Fill void in pre-cast plank for holes 4" and larger before installing pipe.
        c. Fill void between pipe or insulation and floor with mineral wool.
        d. Seal both sides with UL rated firestop system.
B. Install chrome plated steel escutcheons at penetrations exposed in finished rooms.

END OF SECTION

# SECTION 21 05 53 - IDENTIFICATION

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Pipe Markers.

### 1.2 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems.

### 1.3 SUBMITTALS

A. Submit under provisions of Division 1.
B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
C. Product Data: Provide manufacturers catalog literature for each product required.

### 1.4 CONTRACT CLOSEOUT SUBMITTALS

A. Submit under provisions of Division 1.
B. Submit valve chart and schedule, including valve tag number, actual location, function, size and valve manufacturer's name and model number.

## PART 2 PRODUCTS

### 2.1 PIPE MARKERS

A. Manufacturers:
   1. W.H. Brady.
   2. Seton Nameplate Company.
B. Color: Conform to ASME A13.1.
C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings; secure with 2" wide tape with arrows indicating flow.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.
B. Prepare surfaces in accordance with Section 09900 for stencil painting.

### 3.2 INSTALLATION

A. Pipe markers:
   1. Install in accordance with manufacturer's instructions.
   2. Locations:
      a. Piping, mains and risers.
         1). Exposed.
B. Pipe identification:
   1. Identify service and flow direction on all new piping of this division.
   2. Install identification in clear view and align with axis of piping. Locate identification not-to-exceed 20 feet on straight runs including risers, adjacent to each valve, at each side of penetration of structure or, enclosure, at each obstruction and within

5 feet of access panel.

3. Identification wording:
   Fire Protection Water
   Drain

END OF SECTION

# SECTION 21 10 00 - PIPING FITTINGS AND SPECIALTIES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Pipe, fittings, valves and connections for sprinkler systems.

### 1.2 REFERENCES

A. ASTM A53 - Pipe, steel, black and hot-dipped, zinc coated welded and seamless.
B. ASTM 135 - Standard Specification for Electrical Resistance-Welded Steel pipe.
C. ASTM A395 - Ferritic Ductile Iron Pressure-Retaining Castings.
D. ASTM A536 - Ductile Iron Castings
E. ASTM A795 - Pipe, steel, black and hot-dipped, zinc coated, welded and seamless for fire protection use.
F. NFPA 13 - Installation of sprinkler systems.
G. NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.

### 1.3 SUBMITTALS

A. Submit under provisions of Division 1.
B. Product Data: Provide data on pipe materials, pipe fittings and valves. Provide manufacturers catalog information. Indicate valve data and ratings.

## PART 2 PRODUCTS

### 2.1 PIPE AND FITTINGS ABOVE GROUND

A. Pipe and fittings for dry pipe sprinkler system shall be galvanized in accordance with ASTM A153.
B. Flexible Stainless Steel Sprinkler Fitting System: In lieu of rigid pipe offsets or return bends for sprinkler drops, an open-gate, multiple-use stainless steel sprinkler fitting system may be used to locate sprinklers as required by final finished ceiling tiles and walls. The drop system shall consist of a UL approved Series AH2 braided type 304 stainless steel flexible tube with a bend radius to 2” to allow for proper installation in confined spaces, a zinc plated steel 1” NPT male threaded nipple for connection to branch line piping, and a zinc plated steel reducer with a ½” or ¾” NPT female thread for connection to the sprinkler head. Union joints shall be provided for ease of installation. The flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB1 bracket. (The bracket shall allow for sprinkler installation before or after the bracket is secured to the sprinkler grid.) The braided drop system is FM approved for sprinkler services to 200 psi (1380 kPa) and can be installed without the use of tools, and the corrugated system is UL listed for sprinkler services to 175 psi (1207 kPa.)
   1. Approvals:
      a. FM-1637 (Braided)
   2. Manufacturers: Victaulic Aqua flex, Flex Head, Viking Flex Drop.

### 2.2 SPECIALTIES

A. Dry-Sprinkler System: Vapor phase Corrosion Inhibitor (VpCI®) system to serve dry sprinkler zones for piping corrosion mitigation.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide General Air Products, Inc. Vapor Pipe Shield.

2. Description: Vapor phase Corrosion Inhibitor (VpCI®) delivery system for dry or pre-action fire sprinkler system providing corrosion protection within sprinkler system piping network. Pneumatic and mechanical device that requires no electricity.
3. Standard: UL 2901B
4. Capacities and Characteristics:
   a. Total Sprinkler System Capacity: To be determined by fire protection contractor.
   b. Shall include shutoff valve to permit servicing without shutting down sprinkler system.
   c. Maximum Operating Pressure: 150-psig(1030-kPa)
   d. Operating Temperature Range: 40°F(4°C) - 150°F(65°C)
5. Included Components:
   a. Stainless Steel Media Enclosure
   b. Water Removal Pre-filter and After-filter
   c. (2) Coalescing Pre-filters
   d. Air Inlet and Outlet ½" FNPT Connections
   e. Shutoff / Isolation Valve
   f. Automatic Drain Ports 3/8" push to connect tubing
   g. ½" Union and 30" Stainless Steel Flex Hose with ½" MNPT Connections
   h. Vapor Indicator Test Port
   i. Wall Mounting Kit
6. All installation and service work shall be designed, installed, inspected, tested, and maintained in accordance with all applicable codes, referenced standards, drawings, documents, the manufacturer's instructions, and the provisions of this specification.
7. General Air Products shall provide technical support during design, installation and over the entire life of the Vapor Corrosion Inhibitor System.

B. Zone Control Valves:
1. Manufacturers:
   a. Up to and including 2": Victaulic Company Series 728.
   b. Over 2": Victaulic Company Series 705.
2. Other acceptable manufacturers offering equivalent products:
   a. Sigma Valve.
   b. Milwaukee Valve Company.
   c. Kennedy.
3. Actuator housings shall be weatherproof.
4. Type, up to and including 2": Full port design, threaded or grooved, bronze ball valve with factory installed supervisory/tamper switch and valve position indicator, FM approved and U.L. listed.

C. Trim and Drain Valves:
1. Manufacturers:
   a. NIBCO KT 585-70-UL & KT-580-70 UL.
2. Other acceptable manufacturers offering equivalent products:
   a. FPPI.
   b. Milwaukee.
   c. Tyco Trim Valves
   d. AGF.

## PART 3 EXECUTION

### 3.1 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.

## 3.2 INSTALLATION

A. Install pipe and fittings in accordance with reference standards, manufacturer's recommendations, and recognized industry practices.
B. 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.
C. Where interferences develop in the field, offset, or reroute piping as required to clear such interferences. Coordinate locations of fire protection 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, ceiling grid layout, light fixtures, and grilles before installing piping.
D. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering.
E. Maintain piping in clean condition internally during construction.
F. Provide clearance for access to valves and piping specialties.
G. Install piping so that system can be drained. Where possible, slope to main drain valve. Slope dry pipe systems subject to freezing at minimum 1/4"/10' on mains and 1/2"/10' on branches. Where piping is not susceptible to freezing and cannot be fully drained, install nipple and cap for drainage of less than 5 gallons or valve/nipple/cap for drainage over 5 gallons. Pipe drain valves to grade or to air gap sewer receptor.
H. Mitered ells, notches tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.
I. Do not route piping within exterior walls.
J. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.
K. 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.
L. Grooved End Installation: All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
    1. The coupling manufacturer's factory trained representative shall provide on-site training for the contractor's field personnel in the use of grooving tools and installation of product. The representative shall periodically visit the job site to ensure best practices in grooved product installation are being followed. (A distributor's representative is not considered qualified to conduct the training.)

## 3.3 PIPING SYSTEM LEAK TESTS

A. Conduct pressure test with test medium of water. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.
B. Test piping in sections or entire system as required by sequence of construction. Do not conceal pipe until it has been successfully tested. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Entire test must be witnessed by the Division's representative.
C. Use clean water and remove air from the piping being tested where possible. Measure and record test pressure at the high point in the system.
D. Test system at 175 psi or higher if required by NFPA #13 for 2 hours showing no leakage.
E. All pressure tests are to be documented on NFPA Contractor's Material and Test Certificate forms.

END OF SECTION

# SECTION 21 13 00 - AUTOMATIC SPRINKLER SYSTEMS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Automatic sprinkler systems:
   1. Dry-pipe.
B. System design, installation, and certification.

### 1.2 REFERENCES

A. NFPA 13 - Installation of sprinkler systems.
B. NFPA 72 - Installation, maintenance and use of protective signaling devices.
C. Applicable provisions of Division 1.

### 1.3 SYSTEM DESCRIPTION

A. Provide automatic sprinkler system to protect building area, as indicated.
B. System components to be UL listed/labeled and FM Global approved; and to be rated for minimum operating pressure of 175 psig.

### 1.4 DESIGN

A. Light hazard areas shall be hydraulically designed to provide 0.10 gpm/sq.ft. over the hydraulically most remote 1500 s.f. with a maximum head spacing of 225 sq.ft./hd.
B. Ordinary Hazard/Group 1 shall be hydraulically designed to provide 0.15 gpm/sq.ft. over the hydraulically most remote 1500 s.f. with a maximum head spacing of 130 sq. ft./hd.
C. For areas protected by the dry pipe systems, increase the most remote sq.ft. area by 30%.
D. Systems design shall conform to systems schedule on the drawings, plus compliance to NFPA and requirements of local authorities having jurisdiction.
E. Design of the hydraulically calculated sprinkler systems shall include a demand for inside and outside hose streams.
F. Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification or Model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.

## PART 2 PRODUCTS

### 2.1 SPRINKLER HEADS

A. Manufacturers:
   1. Reliable.
   2. Viking.
   3. Tyco.
B. Type:
   1. Sprinkler heads shall be of the glass-bulb type as scheduled on the drawings. Body shall be die cast brass, with hex-shaped wrench boss cast into the body to facilitate installation and reduce the risk of damage during installation.
   2. Escutcheons and guards should be listed, supplied and approved for use with the sprinkler by the sprinkler manufacturer.
   3. All sprinklers subject to temperature below 40° F., installed in the pendent or horizontal position, shall be dry-type sprinklers. Length of the dry-type sprinkler

drop assembly shall be adequate to ensure thermal conduction along the drop will not cause the drop nipple or adjacent piping to be subject to freezing. Where the drop nipple penetrates a wall or fixed ceiling construction, the dry-type sprinkler shall be fitted with a matching dry sprinkler boot to close the air gap created by the clearance hole through the wall or ceiling.

4. Fire sprinklers shall be of one manufacturer throughout the building. No mixing of sprinkler brands shall be permitted. Sprinklers shall be of all brass frame construction with a metal Belleville spring seal, coated on both sides with Teflon film. Sprinklers utilizing non-metal parts in the sealing portion of the sprinkler are strictly prohibited. Sprinklers shall have a quick response frangible bulb type fusible element. Sprinklers to be installed in areas with no ceilings shall be of a brass finish and shall be of adequate temperature for the hazard.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Locate sprinkler heads, main piping and valves as indicated on the drawings.
B. Install sprinkler heads to coordinate with all lights, grilles and any other obstructions in ceiling.
C. Center sprinkler heads in ceiling tile and provide piping offsets as required.
D. Where ceiling is to be painted or sprayed, apply paper cover over sprinkler heads to ensure the head and escutcheons do not get coated. Remove protective paper cover after painting or spraying is completed.
E. Provide mountable metal box of spare heads with proper wrench for head replacement.
F. Provide sprinklers below overhead doors and obstructions exceeding 4 feet in width.
G. Provide sprinkler guards on all exposed sprinklers installed less than 8 feet above the floor.
H. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs. Remove protective plastic covers from all sprinklers after building construction is completed, but prior to system commissioning.
I. Store sprinkler system components in their original shipping container, in a clean, dry space protected from weather. Until completion of all finish-out, protective caps/clips shall not be removed from sprinklers or cover plates/escutcheon plates installed. Any painted sprinklers or cover plates shall be replaced.

END OF SECTION

# SECTION 22 05 00 - BASIC PLUMBING REQUIREMENTS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Basic Plumbing Requirements specifically applicable to Division 22 Sections.

### 1.2 ADDITIONAL REQUIREMENTS

A. The General Conditions, the Supplementary General Conditions and Division 1 shall govern work under Division 22, in addition to these Basic Plumbing Requirements.
B. Plumbing Contractor shall be licensed by the State of Wisconsin to furnish and install plumbing systems.

### 1.3 DEFINITIONS

A. "Piping" includes all pipe, fittings, valves, hangers, and other supports and accessories related to such piping.
B. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction, in crawl spaces or buried.
C. "Exposed" means not installed underground or "concealed" as defined above.
D. "Plumbing Work" is all of the work in Division 22.
E. "Contractor" means the Contractor or Subcontractor performing the required work of their respective Divisions.
F. "Or equivalent" means to possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity.
G. "Provide" means the Contractor shall "furnish and install" work and/or equipment.

### 1.4 SUBMITTALS

A. Contractor shall review and certify shop drawings are in compliance with contract documents.
B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
C. Mark dimensions and values in units to match those specified.
D. Engineer's review of Shop Drawings shall not relieve Contractor from the responsibility for any variation from the Contract Documents unless the Contractor has in writing called the Engineer's attention to each such variation at the time of submission and the Engineer has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing review notes; nor shall any review by the Engineer relieve the Contractor from responsibility for having complied with the provisions of the contract, or from responsibility for errors or omissions in the shop drawings.
E. Physical dimension of shop drawings submitted for review shall not exceed 8-1/2" x 11" unless it is impossible to illustrate data properly without using a larger sheet.
F. Electronic submittal process:
   1. Contractor shall provide engineer with one paper or electronic copy of the submittal for review.
   2. Contractor shall submit and notify engineer of electronic shop drawing posting to the project web site with information matching the paper copy.
   3. Engineer will review the paper or electronic submittal and provide electronic shop drawing review response. Response will be posted on project web site.

### 1.5 SUBSTITUTIONS

A. Contractor shall provide all supporting data and assume the "burden of proof' that any substitute proposed is "equivalent' as to appearance, construction, capacity and performance. The judgement of equivalency shall be made by the Engineer at the time of shop drawing review, not during bidding.
B. Where substitute equipment is accepted and use of such equipment shall require any redesign of structure, foundations, utilities, piping, wiring or of any other part of the architectural, structural, mechanical, sanitary or electrical work, the cost of all such redesign, drawings, detailing and accompanying additional costs of any item of the work shall be paid for by the Contractor. Redesign shall be subject to the approval of all authorities having jurisdiction over the work including the Architect/ Engineer.
C. Contractor shall provide ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit and any other additional materials and equipment required by the system due to accepting equipment substitutions at no additional cost to the owner.

## 1.6 GUARANTEES AND WARRANTIES

A. Contractor shall guarantee, in writing, that all work installed shall be free from any and all defects in workmanship and materials; that all apparatus shall develop capacities and characteristics specified; and that if, during the period of one year, or as otherwise specified, from the date of substantial completion, any defects in workmanship, material or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within a reasonable time as specified in notice from the Owner's Representative. In default thereof, the Owner's Representative shall have the work done and charge the cost of the work to the Contractor.
B. Furnish manufacturers written warranties for all equipment, stating effective date of Warranty, to the Owner's Representative.

## 1.7 CUTTING AND PATCHING

A. This Contractor shall be responsible for establishing sizes and locations of all openings and lintels in new work and to transmit this information to the Contractor whose work is involved at such time as to avoid cutting and patching.
B. All patching shall match adjacent surfaces.
C. Contractor shall inspect and take note of existing conditions along with the Owner's Representative so as to avoid later disputes with regard to the condition of the existing surface before work began.
D. Openings through existing concrete shall be core-drilled or saw cut.

## 1.8 JURISDICTION OF WORK

A. The event of jurisdiction (as to whether the work is to be installed by another trade or subcontractor) shall not release the work from this Contract. In such occurrence, the original contractor shall sublet the work to the trade or subcontractor having jurisdiction.
B. The trade or subcontractor having jurisdiction shall perform the work in conformance with these drawings and specifications.

## 1.9 OPERATION AND MAINTENANCE MANUALS

A. Submit to comply with requirements outlined in Division 1.
B. Submit material in three-ring binders or electronic format with an index at the beginning of each volume and tabs for each section. In addition to the data indicated in the contract closeout submittal paragraph of each section, include the following:
   1. Copies of all approved shop drawings.
   2. Records of all tests performed to certify compliance with system requirements.

3. Certificates of inspection by regulatory agencies.
4. Valve chart and schedules.
5. Equipment manufacturer's warranties and date of warranty period.
6. Equipment manufacturer's start-up and field service reports.
7. Piping system testing and cleaning documentation.

C. Provide all plumbing system supporting documentation and information required to assist the owner in achieving Focus on Energy (FOE) incentives, including (but not limited too) equipment confirmation, application, incentives, etc.

## 1.10 OPERATING INSTRUCTIONS

A. Contractor shall, upon completion of all work and of all tests, furnish the necessary skilled, qualified personnel for operating the system during times agreed to by the owner's representative.
B. During this period, instruct the owner's representative fully in the operation, adjustment and maintenance of all equipment furnished.
C. Give at least forty-eight (48) hours notice to the owner's representative in advance of this period.
D. Contractor shall maintain a record of operating instruction periods, documenting the date, time involved, people in attendance and have the owner's representative attest in writing for each session held; only documented and signed records shall be used to show compliance to the specified instruction periods.

## 1.11 PLUMBING DOCUMENTATION AVAILABILITY

A. Electronic files and transfer:
1. The Plumbing contractor may obtain electronic Plumbing building design model information for contractor development of the construction model.
2. Plumbing electronic design information will be available via electronic transfer or posted to project http site upon request of client.
3. Design model information available will contain 2-D ACAD, 3-D ACAD or 3-D Revit based information to generate the Plumbing building modeling drawings from the Engineer.
4. The architectural electronic building design drawing information must be obtained from the Architect.

## 1.12 INTERIOR EXCAVATION AND BACKFILLING

A. Contractor shall do all excavating and backfilling as required for the underground work of this Division.
B. Refer to specification sections of this Division for excavating and backfilling requirements.

## 1.13 EXISTING WORK

A. Remove all plumbing related piping, fixtures and equipment as indicated by the drawings and specifications to be demolished.
B. All materials, fixtures and equipment removed, except that specifically specified or shown on the drawings to be salvaged, shall become the property of the Contractor and shall be hauled from the job site.
C. Remove, salvage, and deliver to the project salvage site, items specifically identified to be turned over to the owner. The project salvage site shall be an area at the job site and determined by the Architect.

## 1.14 ELECTRICAL WORK

A. Contractor shall provide all electrical work required for low voltage wiring associated with the work of this contract.
B. All electrical work shall comply with the requirements of Division 26.

### 1.15 SITE VISIT

A. Contractor shall visit job site and become familiar with existing conditions prior to starting work.

## PART 2 PRODUCTS

### 2.1 ACCESS PANELS

A. Manufacturers:
   1. Milcor.
   2. Knapp.
   3. Zurn.
B. Panels shall be of adequate size to permit adjustment or service of concealed devices.
C. Panel design shall be suitable for installation in the material forming the finished surface.
D. Panels in masonry or plaster surfaces shall have a flush metal frame and flush, hinged steel door with flush latch. Latches shall be key operated cylinder lock or screwdriver operated.
E. Panels in acoustic ceiling shall be recessed type, to which tile can be attached flush with the ceiling tile.
F. Panels shall be UL listed to conform to the fire rating of the surface it is installed in.

### 2.2 FIRESTOP MATERIALS

A. Manufacturers:
   1. 3M.
   2. Insta-Foam Products.
   3. Dow Corning.
   4. HILTI.
B. One-part, intumescent elastomer, non-corrosive to metal, and compatible with synthetic cable jackets.
C. Material shall expand up to 10 times when exposed to flame or heat.
D. UL classified.
E. Maximum flame spread and fuel contributed of 25 and smoke development of 50 when testing in accordance with ASTM E84.

## PART 3 EXECUTION

### 3.1 ACCESS PANELS

A. Provide access panels for access to equipment, valves, or other specialties installed behind wall or above ceiling surfaces.
B. Lay-in acoustical tee bar ceilings and snap-in removable metal pan ceilings shall be considered adequate for access.
C. Contractor shall sublet installation work to subcontractors specifically skilled in the construction of the surfaces involved.
D. Contractor shall confer with the other Project Contractors with respect to access panel locations and shall, wherever practicable, group devices in such a manner so as to eliminate as many panels as possible.
E. Contractor shall remove all markings and labels from access panels.

## 3.2 FIRESTOP MATERIALS

A. Firestop systems shall be UL listed.
B. Penetrations through fire and/or smoke rated construction shall be sealed to maintain the rating of the construction in which they occur.
C. Comply with the manufacturer's requirements for proper installation of firestop materials to obtain the required fire and/or smoke rating.

## 3.3 NEW, EXISTING AND DEMOLITION WORK

A. Contractor shall provide all materials and labor required to do the new plumbing work and demolition work as shown.
B. Certain vertical and horizontal offsets are shown in piping to indicate the general position relationship of the systems; provide additional offsets, as required to coordinate with the installation requirements of other systems. Route piping in interstitial and ceiling spaces in designated spaces.
C. Install all piping to best suit field conditions and coordinate with the installation work of other trades; the drawings are diagrammatic and shall not be scaled to determine exact locations.
D. Contractor shall provide sleeves into existing walls as required.
E. Contractor shall perform all code required disconnection of drain and water lines, and any other specific demolition work noted on the drawings.
F. All openings, due to the removal or relocation of existing equipment or piping, shall be sealed by this Contractor; sealing material and installation shall conform to the fire and smoke rating of wall or floor in which opening occurs.
G. Remove all existing fixtures, equipment and related piping as indicated.
H. Waste and vent pipes which shall be removed to the stack, when possible, and capped or plugged.
I. Supply pipes which are to be removed shall be removed back to the main or the riser, valved and capped.
J. Remaining piping shall be capped so as to be concealed below floor, in ceiling, or in wall.
K. Existing piping which is to be removed shall become the property of this Contractor and be removed from the project site.
L. Existing fixtures, equipment, trim and valves removed shall remain the owner’s property; equipment, etc. which the owner does not want, shall become the property of the Contractor and shall be removed from the project site.

## 3.4 SYSTEM INTERRUPTION

A. Prior to interrupting any system operation, Contractor shall obtain approval for the interruption from the Owner.
B. All work, which can be done in advance of the service interruption shall be completed and tested prior to connecting new systems to existing.
C. Coordinate service interruptions, with other trades requiring respective system shut downs, to occur simultaneously to minimize the inconvenience to the Owner and occupants.

END OF SECTION

# SECTION 22 05 10 - EXCAVATING AND BACKFILL

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Excavating trenches for utilities.
B. Compacted fill from top of utility bedding cover to bottom of floor slab.
C. Backfilling and compaction.

### 1.2 REFERENCES

A. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. Rammer and 18-inch Drop.

### 1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit or cable located inside or outside the building.

### 1.4 FIELD MEASUREMENTS

A. Verify that survey benchmark, control point, and intended elevations for the work as shown on drawings.

## PART 2 PRODUCTS

### 2.1 FILL MATERIALS

A. Fill Type: As specified in Sections 22 05 11 and 22 05 12.
B. Concrete: Lean concrete with a minimum of 1 bag of cement per cubic yard.
C. Concrete Floors: As specified in Division 03.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Identify required lines, levels, contours, and datum locations.
B. Protect trees, plant life, lawns, and other features remaining as a portion of final landscaping.
C. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic. Maintain, protect and temporarily support above and below grade utilities which are to remain.
D. Cut out soft areas of subgrade not capable of compaction in place. Backfill with same material as utility bedding and compact to density equal to or greater than requirements for subsequent backfill material.

### 3.2 EXCAVATING

A. Trenching shall include all clearing, grubbing, wet, dry and rock excavation, and all incidental work such as sheet piling, shoring, underpinning, dewatering, pumping, bailing, transportation, filling and backfilling.
B. Excavate subsoil required for utilities.
C. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with work.

D. Do not interfere with 45 degree bearing splay of foundations.
E. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
F. Remove lumped subsoil, boulders, and rock.
G. Correct areas over excavated.
H. Stockpile excavated material in area designated on site and remove excess material not being used, from site.

## 3.3 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.
B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
C. Granular Fill Type A3: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
D. Employ a placement method that does not disturb or damage utilities in trench.
E. Maintain optimum moisture content of fill materials to attain required compaction density.
F. Remove surplus fill materials from site.
G. Leave fill material stockpile areas completely free of excess fill materials.
H. Backfill within the building shall be aggregate type A2 with base coarse type A3.
I. All backfill material shall be compacted to achieve 95% compaction.

## 3.4 CONCRETE FLOOR REMOVAL AND REPLACEMENT

A. Unless specifically shown or specified to be by other Contract Divisions, sawcut, breakout, remove, haul out and replace existing concrete floors as required for the new work.
B. Where floors are to be removed by other Contract Divisions, this Contractor shall mark out areas for removal.
C. Finished floor covering will be provided by other Contract Divisions.

## 3.5 FIELD QUALITY CONTROL

A. Compaction testing will be performed in accordance with ASTM D1557.
B. If tests indicate work does not meet specified requirements, remove work, replace, compact, and retest.

END OF SECTION

# SECTION 22 05 11 - AGGREGATE MATERIALS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Aggregate materials.

### 1.2 REFERENCES

A. Standard Specifications for Sewer and Water Construction in Wisconsin.
B. ASTM D1557 - Test methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 10 lb. Rammer and 18 inch Drop.

### 1.3 SUBMITTALS FOR INFORMATION

A. Materials Source: Submit name of imported materials suppliers.

### 1.4 QUALITY ASSURANCE

A. Perform work in accordance with Standard Specifications for Sewer and Water Construction in Wisconsin.

## PART 2 PRODUCTS

### 2.1 AGGREGATE MATERIALS

A. Aggregate Type A1: Conform to Local Municipal Engineer requirements.
B. Aggregate Type A2: Crushed stone, crushed stone screenings, or bedding sand. Conform to "Standard Specifications for Sewer and Water Construction in Wisconsin."
C. Aggregate Type A3: Granular backfill. Conform to "Standard Specification for Sewer and Water Construction in Wisconsin."

### 2.2 SOURCE QUALITY CONTROL

A. Provide materials of each type from same source throughout the work.
B. Testing and analysis: Perform in accordance with ASTM D1557.

## PART 3 EXECUTION

### 3.1 STOCKPILING

A. Stockpile new material on site at locations designated by construction manager.
B. Stockpile in sufficient quantities to meet project schedule and requirements.
C. Separate differing materials with dividers or stockpile apart to prevent mixing.
D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

### 3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

### 3.3 TESTS

A. Contractor shall include the cost of 3 compaction tests to be performed by an independent testing laboratory. Locations to be as directed by the Architect.
B. If tests indicate materials do not meet specified requirements change materials and retest.

END OF SECTION

# SECTION 22 05 14 - PLUMBING SPECIALTIES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Floor drains.
B. Cleanouts.

### 1.2 REFERENCES

A. ANSI A112.21.1 - Floor Drains.
B. NSF-61 - Drinking Water System Components.

### 1.3 SUBMITTALS

A. Submit under provisions of Division 1.
B. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
C. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.

### 1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.
B. Record actual locations of equipment, cleanouts, backflow preventers, underground and under floor main piping.

### 1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1.
B. Operation Data: Indicate frequency of treatment required for interceptors.
C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

### 1.6 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of Wisconsin Plumbing code. Materials and installation of materials shall comply with the contract documents and applicable governing codes.
B. Conform to applicable code requirements for installation of backflow prevention devices.
C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.
D. Comply with the “Safe Drinking Water Act” and the “Reduction of Lead in Drinking Water Act”. Specified products are intended to comply with these acts whether specified in the product model number or not.
E. Confirm all materials used in potable water systems comply with currently adopted regulations including NSF-61.

### 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.
B. Accept specialties on site in original factory packaging. Inspect for damage.

## PART 2 PRODUCTS

## 2.1 FLOOR SINKS

A. Manufacturers:
   1. J. R. Smith.
   2. Josam.
   3. Wade.
   4. Watts.
   5. Zurn.
B. Floor Sinks: As indicated on the drawings.

## 2.2 CLEANOUTS

A. Manufacturers:
   1. J. R. Smith.
   2. Josam.
   3. Wade.
   4. Watts.
   5. Zurn.
B. Cleanouts: As indicated on the drawings.

# PART 3 EXECUTION

## 3.1 PREPARATION

A. Coordinate cutting and forming of floor construction to receive drains to required invert elevations.

## 3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Extend cleanouts to finished floor or wall surface. Ensure clearance at cleanout for rodding of drainage system.

END OF SECTION

# SECTION 22 05 29 - SUPPORTS, ANCHORS AND PENETRATIONS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Pipe hangers, supports and anchors.
B. Interior wall and floor pipe penetrations.

### 1.2 REFERENCES

A. ASME B31.1 - Power Piping.
B. ASME B31.2 - Fuel Gas Piping.
C. ASME B31.9 - Building Services Piping.
D. MSS SP58 - Pipe Hangers and Supports - Materials, Design, Manufacturer, Selection, Application, and Installation.
E. ASTM C1107.
F. ASTM C150.
G. ASTM A185.

### 1.3 SUBMITTALS

A. Product Data: Schedule of all hanger and support devices indicating shields, attachment methods and type of device for each pipe size and type of service.
B. Manufacturer's catalog data for all prefabricated pipe penetrations.
C. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.
D. Secondary pipe isolation supports.

### 1.4 QUALITY ASSURANCE

A. Conform to applicable codes and standards for support of piping.

## PART 2 PRODUCTS

### 2.1 PIPE HANGERS, SUPPORTS AND ANCHORS

A. Manufacturers:
   1. Anvil.
   2. B-Line.
   3. Michigan Hanger.
   4. Uni Strut.
   5. PHD Mfg.
   6. Power Strut.
   7. Hubbard Enterprises - Holdrite
B. Conform to ASME B31.9 MSS SP-58.
C. Hangers:
   1. Support of piping shall be by means of engineered products designed for each application. Comply with manufacturer’s design load capacities. Makeshift, field-developed methods such as use of scrap materials, plumbers’ tape, tie wires and similar methods are not permitted.
   2. For uninsulated pipe, sizes 3 inches and under: Carbon steel, adjustable swivel ring, or adjustable clevis. MSS SP-58 Type 10 or Type 1.
   3. For uninsulated pipe, sizes 4 inches and over: Carbon steel, adjustable clevis, MSS SP-58 Type 1.

4. For insulated pipe, all sizes and types: Carbon steel, adjustable, clevis, MSS SP-58 Type 1, oversized to include insulation. Adjustable swivel ring, MSS SP-58 Type 10, oversized to include insulation, is acceptable for pipe sizes 3/4" and smaller.
5. Protect tubing and piping from damage caused by abrasion when passing through studs, joists, and similar framing using abrasion protection isolators.
6. In plenum-rated applications, use tested clamp and isolator support systems designed specifically for this application.
7. Prevent damage to piping and tubing caused by contact between dissimilar metals using insert system designed specifically for this application.

D. Multiple or Trapeze Hangers:
1. Steel channels with welded spacers and hanger rods.
2. Strut shall be 1-5/8" wide in heights and welded combinations as required to meet load capacities.
3. For manufactured strut platforms, the total load of piping components on trapeze spans shall not exceed manufacturer's design load rating. Load calculation and detail of each unit shall include a safety factor of two times the expected load.
4. Strut shall be ASTM A570 Grade 33 steel.
5. Strut fittings shall be ASTM A907 Grade 33.
6. Strut and fittings shall be epoxy painted.
7. Threaded hardware shall be zinc plated.

E. Wall Support:
1. Pipe sizes 2 inches and under: Carbon steel hook.
2. Pipe sizes 2-1/2 inches and over: Welded steel bracket and MSS SP-58 Type 32 or 33 and steel clamp.

F. Vertical Support: Steel riser clamp, MSS SP-58 Type 8.

G. All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated, or polyvinylchloride coated; or provided with an isolation collar or wrap between the supports, fasteners, or clamps and the copper pipe.

H. Accessories:
1. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded, plain finish with adjusting locknuts.
2. Beam Clamps:
   a. MSS SP-58 Type 23 malleable black iron clamp for attachment to beam flange for use with pipe sizes 4 inches and less. Furnish with a hardened steel cup point set screw.
   b. MSS SP-58 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 but limited in application to pipe sizes 8 inches and less without prior approval.
3. Structural and miscellaneous steel:
   a. Angles, channels, and beams: ASTM A36 and A572 as required.
   b. Tubing: ASTM A500 Grade B.
   c. Unfinished bolts: ASTM A307, Grade A, length required with no threads in contact with bearing surfaces, fitted with self-locking nuts and washers.
4. Concrete Inserts:
   a. MSS SP-58 Type 18 wedge type or universal concrete inserts for pipes 8" and under.
   b. Wedge type: 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.
   c. Universal type: Black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8-inch diameter.
   d. Use drilled steel shell with plug type inserts when the inserts are placed after the concrete is poured.
   e. Powder actuated anchors are not acceptable.
5. 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.
b. Load rating of 2000 pounds per foot in concrete.
c. Manufacturer's standard brackets, inserts, and accessories designed for the channel inserts may be used.
d. Select insert length to accommodate all pipe, duct, and conduit in the area.

6. Shields: Galvanized, carbon steel, half round, MSS 58, Type 40.

I. Powder actuated anchors are not acceptable.

J. Secondary Pipe Supports:

1. Consisting of engineered through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material and associated support brackets.
2. All in-wall piping shall be supported with engineered secondary pipe supports as manufactured by Holdrite, Sioux Chief, or approved equivalent.

## 2.2 INTERIOR WALL AND FLOOR PIPE SLEEVES

A. Material: Minimum 18-gauge galvanized steel for walls and steel pipe for floors.
B. Diameter: One inch larger than outside diameter of the pipe, conduit, or pipe insulation.
C. Length: Sufficient length to pass thru wall or floor. Sleeves in Mechanical Room floors shall extend 6" above finished floor.

# PART 3 EXECUTION

## 3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide all supporting steel, not indicated on drawings, that is required for installation of mechanical equipment and materials, including angles, channels, beams, etc.
C. Support all piping from the structure.

## 3.2 PIPE HANGERS AND SUPPORTS

A. Size hangers for insulated piping to accommodate thickness of insulation. Hangers and supports shall be placed on the exterior of the pipe insulation, except for riser clamp floor supports used on vertical piping.
B. Pipe hangers shall be spaced in accordance with the manufacturer’s recommendations and per applicable codes.
C. Isolate copper piping from dissimilar metal hangers, supports and clamps.
D. Install hangers to provide minimum 2-inch space between finished covering and adjacent work.
E. Place hangers within 12 inches of each horizontal elbow.
F. Use hangers with 1-1/2-inch minimum vertical adjustment.
G. Support vertical piping at every floor.
H. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers. Piping shall be clamped at each support location. Strut clamps, where not required for pipe support, shall be used as a guide on trapeze hangers.
I. Support riser piping independently of connected horizontal piping.
J. Design hangers for pipe movement without disengagement of supported pipe.
K. Adjust hangers to obtain the slope specified in the appropriate piping section.
L. Provide insulation protection shields at hanger and support locations on all insulated piping.

## 3.3 INSERTS

A. Provide inserts 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 inches.
D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

## 3.4 INTERIOR WALL AND FLOOR PENETRATIONS

A. Piping:
   1. Thru walls where drywall or masonry does not extend to structure: No special requirements.
   2. Thru walls where drywall, concrete, or masonry extends to structures and thru floors:
      a. For new concrete walls and floors, furnish and install sleeves.
      b. For new masonry walls, furnish sleeves to the appropriate contractor for installation. Provide sleeve layout.
      c. For new fire rated drywall walls, furnish and install sleeves.
      d. For non-rated drywall walls, no sleeve is required.
      e. For existing masonry walls, provide sleeve and grout sleeve in wall.
      f. Fill void between pipe or insulation and wall, floor or sleeve with mineral wool.
      g. Non-rated walls and floors: Caulk both sides with non-hardening caulk.
      h. Rated walls and floors: Seal both sides with UL rated firestop system.
   3. Thru precast deck:
      a. Core-drill hole thru topping and pre-cast deck. No sleeve is required.
      b. Fill void between pipe or insulation and floor with mineral wool.
      c. Seal both sides with UL rated firestop system.
   4. Thru precast deck with waterproof membrane:
      a. Core-drill hole thru pre-cast deck. Furnish and install sleeve to attach top of pre-cast deck. Sleeve shall extend minimum 2" above top of topping and shall be used for attaching membrane and as concrete stop.
      b. Fill void in pre-cast plank for holes 4" and larger before installing pipe.
      c. Fill void between pipe or insulation and floor with mineral wool.
      d. Seal both sides with UL rated firestop system.
B. Install chrome plated steel escutcheons at penetrations exposed in finished rooms.

END OF SECTION

# SECTION 22 05 53 - IDENTIFICATION

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Tags.
B. Pipe Markers.

### 1.2 REFERENCES

A. ASME/ANSI A13.1 - Scheme for the Identification of Piping Systems.

### 1.3 SUBMITTALS

A. Submit under provisions of Division 1.
B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
C. Product Data: Provide manufacturers catalog literature for each product required.

### 1.4 CONTRACT CLOSEOUT SUBMITTALS

A. Submit under provisions of Division 1.
B. Submit valve chart and schedule, including valve tag number, actual location, function, size and valve manufacturer's name and model number.
C. For additions and remodeling projects, the new valve numbers shall be a continuation of the existing numbering system as directed by the Owner.

## PART 2 PRODUCTS

### 2.1 TAGS

A. Manufacturers:
   1. W.H. Brady.
   2. Seton Name Plate Company.
B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.
C. Chart: Typewritten letter size list in anodized aluminum frame.

### 2.2 PIPE MARKERS

A. Manufacturers:
   1. W.H. Brady.
   2. Seton Nameplate Company.
B. Color: Conform to ASME A13.1.
C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings; secure with 2" wide tape with arrows indicating flow.
D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 09900 for stencil painting.

## 3.2 INSTALLATION

A. Tags:
   1. Install with brass chain and "S" hooks around valve stem.
   2. Locations:
      a. Main and branch piping valves.
      b. Fixture stops shall not be tagged.

B. Pipe markers:
   1. Install in accordance with manufacturer's instructions.
   2. Locations:
      a. Piping:
         1). Exposed.
         2). Concealed in accessible spaces
   3. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe; outside of the building footprint.

C. Pipe identification:
   1. Identify service and flow direction on all new piping of this division.
   2. Install identification in clear view and align with axis of piping. Locate identification not-to-exceed 20 feet or straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, at each obstruction, and within 5 feet of each access panel.
   3. Identification wording:
      Domestic Cold Water
      Domestic Hot Water
      Sanitary Waste
      Sanitary Vent

END OF SECTION

# SECTION 22 11 00 - WATER SUPPLY SYSTEM

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Domestic water piping system.
B. Valves.

### 1.2 REFERENCES

A. ANSI B31.9 - Building Service Piping.
B. ASME - Boiler and Pressure Vessel Code.
C. ASME Sec. 9 - Welding and Brazing Qualifications.
D. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
E. ASME B16.3 - Malleable Iron Threaded Fittings.
F. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.
G. ASME B16.18 - Cast Bronze Solder-Joint Pressure Fittings.
H. ASME B16.22 - Wrought Copper and Bronze Solder-Joint Pressure Fittings
I. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.
J. ASTM A47 - Ferritic Malleable Iron Castings.
K. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
L. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
M. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
N. ASTM B32 - Solder Metal.
O. ASTM B42 - Seamless Copper Pipe.
P. ASTM B43 - Seamless Red Brass Pipe.
Q. ASTM B75 - Seamless Copper Tube.
R. ASTM B88 - Seamless Copper Water Tube.
S. ASTM B251 - Wrought Seamless Copper and Copper-Alloy Tube.
T. AWS A5.8 - Brazing Filler Metal.
U. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
V. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
W. AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Grey-Iron Pressure Pipe and Fittings.
X. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
Y. AWWA C651 - Disinfecting Water Mains.
Z. NSF-61 - Drinking Water System Components.

### 1.3 SUBMITTALS

A. Submit under provisions of Division 1.
B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

### 1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.
B. Record actual locations of valves.

### 1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1.
B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

## 1.6 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.

## 1.7 REGULATORY REQUIREMENTS

A. Perform Work in accordance with State of Wisconsin plumbing code. Materials and installation of materials shall comply with the contract documents and applicable governing codes.
B. Conform to applicable code requirements for installation of backflow prevention devices.
C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.
D. Comply with the “Safe Drinking Water Act” and the “Reduction of Lead in Drinking Water Act”. Specified products are intended to comply with these acts whether specified in the product model number or not.
E. Confirm all materials used in potable water systems comply with currently adopted regulations including NSF-61.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.
B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
C. Provide temporary protective coating on cast iron and steel valves.
D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

# PART 2 PRODUCTS

## 2.1 WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ASME B16.18, cast bronze, or ASME B16.22, wrought copper.
   2. Joints: ASTM B32, lead free solder with ASTM B813 soldering flux, grooved couplings ASTM A-536 with EPDM gasket ASTM D-2000, or AWS A5.8, BCup silver braze. Mechanically formed brazed tee connections may be used in lieu of specified tee fittings for branch take-offs up to one-half (1/2) the diameter of the main.
   3. Copper press connection system:
      a. Apollo Press
      b. NIBCO Press System.
      c. Viega ProPress.

## 2.2 BALL VALVES

A. Manufacturers:
   1. Nibco Model S-585-66-LF.
   2. Other acceptable manufacturers offering equivalent products.
      a. Apollo Valves Model 77CLF-24X-01A.
      b. Crane.
      c. Hammond.

d. Watts.
e. Milwaukee.

B. Up to and including 2 Inches: Lead-Free Bronze two-piece body, full port, stainless steel ball, Teflon seats and stuffing box ring, lever handle, solder ends.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

### 3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide non-conducting dielectric connections wherever joining dissimilar metals.
C. Route piping in orderly manner and maintain gradient.
D. Install piping to conserve building space and not interfere with use of space. Piping shall be concealed within walls and chases or above ceilings. Obtain approval of the owner's representative prior to installing exposed piping.
E. Group piping whenever practical at common elevations.
F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Provide pipe support so as to not cause noise due to pipe movement.
G. Provide clearance for installation of insulation and access to valves and fittings.
H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with the work of other trades.
I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
J. Install valves with stems upright or horizontal, not inverted.

### 3.3 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.
B. Install brass male adapters each side of threaded valves or devices in copper piped system. Sweat solder adapters to pipe.
C. Install ball valves for water shut-off and to isolate equipment, part of systems, or vertical risers.

### 3.4 ERECTION TOLERANCES

A. Slope water piping and arrange to drain at low points.

### 3.5 TESTING AND BALANCING

A. The water distribution system shall be tested and proven watertight under a water pressure of 100 psi gauge.
B. The test shall be performed with potable water for a period of four (4) hours.
C. Flush all new piping and verify that sufficient water flow, pressure and temperature is available at each outlet and equipment connection.
D. Circulating hot water systems shall be balanced to insure proper circulation of hot water in the system with hot water available to all fixtures and connections.
E. Hot water circulating systems shall be set to operate continuously unless specifically noted otherwise.

## 3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Each water outlet shall be flushed. The flushing of each water outlet shall continue for at least one minute and until the water appears clear at the outlet.

B. Following the flushing of the system, a chloroform bacteria test as well as a plate count test shall be made from three (3) locations within the altered system. The three (3) locations shall be one (1) from each end, and one (1) in the middle of the system. The value of the plate count test from each of the three (3) locations shall not exceed five hundred (500) colonies per milliliter. Contractor shall disinfect and test until the specified plate count has been met.

C. Contractor shall submit the test reports to the Owner's Representative. Test reports shall indicate specific location in system, where test was made, and tests results.

D. If disinfection of the water distribution system is required, it shall be done as follows:
   1. The pipe system shall be flushed with clean water until clear water appears at the points of outlet.
   2. The system or part thereof shall be filled with a solution of water and chlorine containing at least 50 parts per million of chlorine and the system or part thereof shall be valved off and allowed to stand for 24 hours or the system or part thereof shall be filled with a solution of water and chlorine containing at least 200 parts per million of chlorine and allowed to stand for 3 hours.
   3. Following the allowed standing time, the system shall be flushed with clean potable water.

END OF SECTION

# SECTION 22 13 00 - DRAIN, WASTE, VENT AND CONDUCTOR PIPING

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Sanitary piping system.

### 1.2 REFERENCES

A. ANSI B31.9 - Building Service Piping.
B. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
C. ASME B16.4 - Cast Iron Threaded Fittings Class 125 and 250.
D. ASME B16.23 - Cast Copper Alloy Solder-Joint Drainage Fittings - DWV.
E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
F. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
G. ASTM A74 - Hub and Spigot Cast Iron Soil Pipe and Fittings.
H. ASTM A888 - Hubless Cast Iron Soil Pipe and Fittings.
I. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
J. ASTM B32 - Solder Metal.
K. ASTM B88 - Seamless Copper Water Tube.
L. ASTM C14 - Concrete Sewer, Storm Drain, and Culvert Pipe.
M. ASTM C425 - Compression Joints for Vitrified Clay Pipe and Fittings.
N. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
O. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
P. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80 and 120.
Q. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
R. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
S. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
T. ASTM D2665 - Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste and Vent Pipe and Fittings.
U. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
V. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
W. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
X. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
Y. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
Z. CISPI 301 - Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
AA. CISPI 310 - Couplings for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications.
BB. NSF International

### 1.3 SUBMITTALS

A. Submit under provisions of Division 1.
B. Product Data: Provide data on pipe materials, pipe fittings and accessories. Provide manufacturers catalog information.
C. Cast iron service weight and no hub pipe and fittings shall be manufactured by a member of the Cast Iron Soil Pipe Institute: AB & I, Charlotte and Tyler.

D. Cast iron service weight and no hub pipe and fittings, and no hub couplings, shall bear the mark of NSF International demonstrating third party certification.

## 1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1.
B. Record actual locations of cleanouts.
C. Record actual locations and elevations of underground piping.

## 1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1.

## 1.6 REGULATORY REQUIREMENTS

A. Perform work in accordance with State of Wisconsin plumbing code. Materials and installation of materials shall comply with the contract documents and applicable governing codes.
B. Comply with applicable local ordinances and requirements for installation of storm water drainage systems.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.
B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## 1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding material is saturated or frozen.

# PART 2 PRODUCTS

## 2.1 SANITARY PIPING, BURIED WITHIN 5 FEET OF BUILDING AND INTERIOR BELOW GROUND

A. Cast Iron Pipe: ASTM A74, service weight.
   1. Fittings: ASTM A74 cast iron.
   2. Joints: ASTM C564, neoprene gasket system.
B. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: CISPI 301 cast iron.
   2. Joints: CISPI 310 stainless steel clamp-and-shield assemblies with ASTM C564 gaskets.
C. PVC Pipe: ASTM D1785.
   1. Fittings: PVC, ASTM D2665.
   2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

## 2.2 SANITARY PIPING, NOT IN GROUND

A. Cast Iron Pipe: CISPI 301, hubless.
   1. Fittings: CISPI 301, hubless.
   2. Joints: CISPI 310, Stainless steel clamp-and-shield assemblies with ASTM C564 gaskets.

3. Joints: For sizes 4" and larger, provide heavy-duty couplings manufactured by Clamp-All, Mission, Husky, or equivalent.

B. Copper Tubing: ASTM B88, Type M.
   1. Fittings: ASME B16.23, cast bronze or ASTM B16.29 wrought copper.
   2. Joints: ASTM B32, solder, Grade 50B.

C. PVC Pipe: ASTM D1785, Schedule 40 DWV.
   1. Fittings: PVC, ASTM D2665.
   2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plan end ferrous pipe.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Keep all open ends of piping closed with pipe plugs or caps at all times except when work is in progress.

### 3.2 INSTALLATION

A. All work shall be constructed in an approved manner to the complete satisfaction of the owner's representative and authorities having jurisdiction.
B. Install in accordance with manufacturer's instructions.
C. Route piping in orderly manner and maintain gradient.
D. Install piping to conserve building space and not interfere with use of space. Piping shall be concealed within walls and chases or above ceilings. Obtain approval of the owner's representative prior to installing exposed piping.
E. Group piping whenever practical at common elevations.
F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
G. Provide clearance for installation of insulation.
H. Verify existing and proposed sewer elevations in the field and notify the owner's representative in writing of any variation of the elevations noted on the drawings before any sewer and building drain work is begun.
I. Provide excavation and backfill for work of this Section.
J. Install bell and spigot pipe with bell end upstream.
K. All drain and waste branch connections and changes of directions more than 45 degrees shall be made with wyes and 1/8 bends, or as indicated.
L. In-ground fittings located at the base of drain and waste stacks and conductors shall be long sweep type.
M. Materials having cracks or sand holes will not be allowed and shall be replaced.
N. Cleanout connections in sewer lines shall be made with wyes and 1/8 bends.
O. Cleanouts at ends of sewers shall be made with two 1/8 bends or a long sweep 1/4 bend.
P. Do not route waste piping over food preparation areas or over electrical equipment and its related service area.
Q. Plastic materials used in return air ceiling plenums shall meet fire rating requirements for flame spread and smoke generation. Plastic piping materials shall be insulated in accordance with building code requirements.

### 3.3 ERECTION TOLERANCES

A. Establish invert elevations, slopes for drainage to 1/4 pitch per foot for piping up to and including 2" and 1/8" pitch per foot for piping larger than 2".

### 3.4 TESTING

A. Every section of the piping systems provided under this specification section shall be tested under a minimum 10-foot head of water or an air pressure of 5 psig for a period of 15 minutes, without a drop in water level or air pressure.

END OF SECTION

# SECTION 22 42 00 - PLUMBING FIXTURES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Sinks.

### 1.2 PRODUCT APPROVAL

A. Plumbing products requiring approval by the State or Local authority must be approved or have pending approval at the time shop drawings are submitted.

### 1.3 REFERENCES

A. ANSI/ASME A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
B. ASME A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
C. ANSI/ASME A112.19.3 - Stainless Steel Plumbing Fixtures.

### 1.4 SUBMITTALS

A. Submit under provisions of Division 1.
B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, capacities, materials, trim, and finishes.
C. Color or finish selection chart for items where selection from standard colors or finishes is available.
D. Manufacturer's Installation Instructions and Performance Limitations.

### 1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division 1.
B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

### 1.6 REGULATORY REQUIREMENTS

A. Comply with the “Safe Drinking Water Act” and the “Reduction of Lead in Drinking Water Act”. Specified products are intended to comply with these acts whether specified in the product model number or not.
B. Confirm all materials used in potable water systems comply with currently adopted regulations including NSF-61.
C. Confirm installation complies with the provisions of Americans with Disabilities Act, where applicable.
D. Low flow fixtures shall conform to LEED, WaterSense or Green Globes.

### 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1.
B. Accept fixtures on site in factory packaging. Inspect for damage.
C. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

### 1.8 FIELD MEASUREMENTS

A. Verify all rough-in and finishing measurements in the field.
B. Confirm that millwork is constructed with adequate provision for the installation of countertop sinks.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. The manufacturers and catalog numbers specified establish a type, size, standard of quality, materials, and performance rating for the product.
B. Like fixtures shall be the product of the same manufacturer.
C. Fixtures shall be white unless a color is indicated.
D. Safety covers over exposed waste and supply piping at ADA accessible fixtures shall be Handi-Lav-Guard by Truebro, Plumberex PRO-2000, or equivalent.
E. Products of the same type, quality and ratings as determined by the Architect/Engineer or owner will be acceptable.
   1. Stainless Steel Sinks: Elkay, Just, Moen Commercial.
   2. Faucets: American Standard, Chicago Faucet, Delta Commercial, Elkay, Kohler, Moen Commercial, Sloan, Speakman, Symmons, T & S Brass, Zurn.
   3. Drains and Traps: Dearborn, Keeney, Kohler, McGuire, Engineered Brass, Zurn.
   4. Stops and Supplies: Dearborn, Keeney, Kohler, McGuire, Zurn.
   5. Carriers and Supports: Josam, Smith, Wade, Watts, Zurn.

### 2.2 PLUMBING FIXTURES

A. Refer to fixture schedule on the drawings.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

### 3.2 PREPARATION

A. Rough-in fixture piping connections in accordance with code requirements and manufacturers recommendations.
B. Furnish templates for cutting of countertops by Millwork Contractor for sink installation.

### 3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install each fixture with trap, easily removable for servicing and cleaning.
C. Provide chrome plated rigid or flexible supplies to fixtures with stops, reducers, and escutcheons in readily accessible location for servicing.
D. Install components level and plumb and connect to all required piping services.
E. Secure fixtures in place to counters, floors and walls providing solid bearing and securer mounting.
F. Seal fixtures to wall and floor surfaces with mildew-resistant silicone sealant, color to match fixture.
G. Provide backing and secure rough-in fixture piping to prevent movement of exposed piping and transmission of noise.
H. Install barrier-free fixtures in compliance with local codes and Federal ADA accessibility guidelines.
I. Offset drain and supply piping and provide insulating covers on exposed piping to avoid contact with wheelchair users.
J. Cover pipe penetrations with escutcheons. Exposed traps, piping and escutcheons shall be chrome plated brass.

### 3.4 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

## 3.5 ADJUSTING

A. Adjust work under provisions of Division 1.
B. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow. Adjust to be ready for use or put into automatic operation.

## 3.6 CLEANING

A. Clean work under provisions of Division 1.
B. At completion, thoroughly clean plumbing fixtures and equipment.

## 3.7 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 1.
B. Do not permit use of fixtures and protect fixtures during construction.

## 3.8 FIXTURE HEIGHTS

A. Install fixtures to heights above finished floor as indicated.
B. Refer to architectural drawings and wall elevations.
C. Comply with all requirements of ADA.

END OF SECTION

# SECTION 23 05 00 - BASIC MECHANICAL REQUIREMENTS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Basic Mechanical Requirements specifically applicable to Division 23 Sections.

### 1.2 REFERENCES

A. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
B. SPS 341-342 - Boiler and Pressure Vessel, Dept. of Commerce, Wisconsin Administrative Code.
C. SPS 345 - Mechanical Refrigeration, Dept. of Commerce, Wisconsin Administrative Code.

### 1.3 ADDITIONAL REQUIREMENTS

A. The General Conditions, the Supplementary General Conditions and Division 1 shall govern work under Division 23, in addition to these Basic Mechanical Requirements.

### 1.4 DEFINITIONS

A. “Piping” includes all pipe, fittings, valves, hangers, and other supports and accessories related to such piping.
B. “Ductwork” includes all ducts, fittings, transitions, dampers, hangers and other supports and accessories related to such ductwork.
C. “Concealed” means hidden from sight in chases, furred spaces, shafts, hung ceilings, crawl spaces, embedded in construction or buried.
D. “Exposed” means not concealed as defined above.
E. “Mechanical Work” is all of the work in Division 23.
F. "Contractor" means the Contractor or Subcontractor performing the required work of their respective Divisions.
G. “Or Equivalent” means to possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity.
H. “Provide” means the Contractor shall furnish and install work and/or equipment.
I. “Corrosive area” means areas where chemicals may be present, such as chemical storage rooms, janitors closets and housekeeping rooms.

### 1.5 SUBMITTALS

A. Refer to Specification Section 01 33 00 – Submittal Procedures for additional requirements.
B. Contractor shall review and certify submittals are in compliance with the contract documents.
C. Submit product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
D. Mark dimensions and values in units to match those specified.
E. Engineer's review of submittals shall not relieve Contractor from the responsibility for any variation from the Contract Documents unless the Contractor has called the Engineer's attention in writing to each such variation at the time of submission and the Engineer has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the submittal review notes; nor shall any review by the Engineer relieve the Contractor from responsibility for having complied with the provisions of the contract, or from responsibility for errors or omissions in the submittals.

F. Physical dimension of shop drawings shall not exceed 8-1/2" x 11" unless impossible to illustrate data properly without using a larger sheet.
G. Electronic design model information shall not be utilized for equipment submittals sizes and quantities.

## 1.6 SUBSTITUTIONS

A. Refer to Specification Section 01 25 00 – Substitution Procedures for additional requirements.
B. Contractor shall provide all supporting data and assume the burden of proof that any substitute proposed is equivalent as to appearance, construction, capacity and performance. The judgment of equivalency shall be made by the Engineer at the time of shop drawing review, not during bidding.
C. Where substitute equipment is accepted and use of such equipment shall require redesign of any other part of the architectural, structural, mechanical, sanitary or electrical work, the cost of all such redesign, drawings, detailing and accompanying additional costs of any item of the work shall be paid for by the Contractor. Redesign shall be subject to the approval of all authorities having jurisdiction over the work including the Architect /Engineer.
D. Provide ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit and any other additional materials and equipment required by the system due to equipment substitutions at no additional cost to the owner.

## 1.7 GUARANTEES AND WARRANTIES

A. Guarantee in writing that all work installed shall be free from defects in workmanship and materials; that all apparatus shall develop capacities and characteristics specified; and that if during the period of one year (or as otherwise specified) from the date of substantial completion, any defects in workmanship, material or performance appear, the Contractor shall remedy such defects within a reasonable time as specified in notice from the Owner's Representative without cost to the owner. In default thereof, the Owner's Representative shall have the work done and charge the cost of the work to the Contractor.
B. Furnish manufacturers written warranties for all equipment, stating effective date of Warranty, to the Owner's Representative.

## 1.8 CUTTING AND PATCHING

A. Refer to Specification Section 01 73 29 – Cutting and Patching for additional requirements.
B. Establish sizes and locations of openings and lintels in new work and transmit this information to the Contractor whose work is involved at such time as to avoid cutting and patching.
C. Patching shall match adjacent surfaces.
D. Inspect and take note of existing conditions along with the Owner's Representative to avoid later disputes with regard to the condition of the existing surface before work began.
E. Core-drill or saw cut openings through existing concrete.
F. All cutting and patching that shall be necessary for the installation of the work of this Contract shall be provided by this Contractor under the direction and to the satisfaction of the Owner’s Representative unless this work is specifically identified to be the work of the Contractors of other Divisions.
G. No cutting of structural work shall be done without the written consent of the Owner’s Representative being previously obtained, and all such work shall be done in accordance with the Owner’s Representative’s directions and supervision.

H. The removal and replacement of lay-in ceiling systems, as required for HVAC work, shall be performed by the HVAC Contractor unless specifically identified to be the work of the contractors of other Divisions.
I. All patching required shall be done by this Contractor to match existing or new construction and adjacent areas. All existing items noted for removal on the drawings shall have adjacent construction patched to match existing. All existing items noted for removal that would, after such removal, leave holes, or other defects in such construction to remain shall be patched by this Contractor to match adjacent construction that remains.

## 1.9 EXISTING WORK

A. Remove all HVAC related piping, ductwork and equipment indicated by the drawings and specifications to be demolished.
B. Materials and equipment removed, except that specifically specified or shown on the drawings to be salvaged, shall become the property of the Contractor and shall be removed from the job site.
C. Remove, salvage and deliver to the project salvage site, equipment indicated by the Owner to be salvaged. The project salvage site shall be an area at the job site as determined by the Architect and/or Owner.

## 1.10 CONSTRUCTION PHASING

A. Coordinate project phasing with construction manager.
B. Coordinate HVAC systems installation to meet project phasing requirements.
C. Provided temporary ventilation systems and relocations as required to maintain services to occupied spaces.
D. Coordinate and provide system relocations as necessary to meet construction phasing requirements.
E. Provide testing and balancing of the temporary or permanant systems to maintain occupancy requirements during construction.
F. Existing temporary connection locations shall have available capacity or be capable of being increased to support the space.
G. Any temporary ventilation systems shall not impact existing space capacities.
H. Remove any temporary systems at the completion utilized for temporary service.
I. Patch and cap all systems and building penetrations to match new or existing construction type.

## 1.11 JURISDICTION OF WORK

A. The event of jurisdiction (as to whether the work is to be installed by another trade or subcontractor) shall not release the work from this Contract. In such occurrence, the original contractor shall sublet the work to the trade or subcontractor having jurisdiction.
B. The trade or subcontractor having jurisdiction shall perform the work in conformance with these drawings and specifications.

## 1.12 OPERATION AND MAINTENANCE MANUALS

A. Submit to comply with requirements outlined in Division 1.
B. Submit material in electronic format with an index at the beginning of each volume and tabs for each section. In addition to the data indicated in the contract closeout submittal paragraph of each section, include the following:
   1. Copies of all approved submittals.
   2. Records of all tests performed to certify compliance with system requirements.
   3. Certificates of inspection by regulatory agencies.
   4. Valve chart and schedules.

5. Lubrication instructions, including list of lubrication done during construction.
6. Equipment manufacturer's warranties and date of warranty period.
7. Material safety data sheets (MSDS) for all chemicals.
8. Equipment manufacturer's start-up and field service reports (air handling units, cooling equipment, heating equipment, variable frequency drives, etc.).
9. Piping system testing and cleaning documentation.
10. Duct system pressure and leakage test documentation.
11. Documentation that all spare parts have been provided as listed in each specification section.
12. Documentation that all penetrations in smoke and/or fire rated construction have been properly sealed and firestopped.

C. Refer to Temperature Controls for work required to verify and document operation of temperature control system. Documentation to be included in operation and maintenance manuals.

D. Submit documentation for above items on manufacturer's/contractors standard forms, which have been customized for this project.

E. Include checklists for all equipment and systems, indicting they have been installed and operating properly.

## 1.13 OPERATING INSTRUCTIONS

A. Upon completion of all work and tests, furnish the necessary skilled, qualified personnel for operating the system for a total of eight (8) hours during times agreed to by the owner's representative.

B. Instruct the owner's representative fully in the operation, adjustment and maintenance of equipment furnished.

C. A representative of the Temperature Control Contractor shall be present during these instruction periods.

D. Give at least forty-eight (48) hours notice to the owner's representative in advance of this period.

E. Maintain a record of operating instruction periods, documenting the date, time involved, people in attendance and have the owner's representative attest in writing for each session held; only documented and signed records shall be used to show compliance to the specified instruction periods.

## 1.14 REFRIGERATION SYSTEM REGISTRATION

A. Prepare, submit and pay all registration fees for each mechanical refrigeration system provided in accordance with SSPS 345 Code, Mechanical Refrigeration. (Obtain forms from the Wisconsin Department of Commerce). Requirements for registration vary, based on refrigerant type and system tonnage.

## 1.15 REFRIGERANT HANDLING REGISTRATION

A. Contractor handling the refrigerant and servicing refrigeration equipment shall be registered with the Wisconsin Department of Commerce to perform such work. Submit documentation that all refrigerant handling was performed by a registered person.

## 1.16 REFRIGERATION EQUIPMENT REMOVAL

A. Contractor removing existing refrigeration equipment shall be registered with the Wisconsin DNR to salvage used equipment. Submit documentation that equipment was removed by a registered person.

## 1.17 HVAC DOCUMENTATION AVAILABILITY

A. Refer to Specification Section 01 31 00 – Project Management and Coordination.
B. Electronic files and transfer:
   1. The HVAC contractor may obtain electrionic HVAC building design model information for contractor development of the construction model.
   2. The architectural electronic building design drawing information must be obtained from the Architect.

## 1.18 RECORD DRAWINGS

A. See General Requirements Division 1, for additional information.
B. The Contractor shall keep a detailed up to date record of the field conditions and routing of systems.
C. Record drawings shall be maintained during project construction.
D. A complete set of reproducible drawings in electronic and hard copy form reflecting all pertinent information shall be completed with the electronic construction model and turned over to the Owner's representative upon project completion.
E. Record drawing shall include the following information but not be limited to:
   1. Actual equipment, ductwork and piping routing and locations.
   2. Access panels serving all equipment and associated temperature control devices.
   3. Ductwork volume dampers.
   4. Piping main isolation valves.
   5. Starters and Variable Frequency Drives.
   6. Fire, Smoke and Fire/Smoke dampers numbers and locations.
   7. Temperature Control Panels.
   8. Temperature Control devices. (i.e. TCV's, Sensors, MOD's, etc.)
   9. Field coordination changes.
   10. Addendums, Field Change Orders, Construction Bulletins, etc.

## 1.19 RESPONSIBILITIES BY THE HVAC CONTRACTOR FOR OWNER FURNISHED EQUIPMENT

A. The HVAC contractor is responsible for the following work relating to owner furnished HVAC equipment.
   1. Disconnect equipment from existing services (where applicable for existing equipment to be relocated).
   2. Schedule delivery of new equipment, or relocation of existing equipment.
   3. Receive, unload, and store equipment.
   4. Arrange delivery for return of any damaged equipment.
   5. Install all equipment in accordance with manufacturer's written instructions.
   6. The owner is responsible for correcting, repairing or replacing any deficiencies during the warranty period for owner furnished equipment.

## 1.20 DESIGN MODEL - LEVEL OF DEVELOPMENT

A. Existing Building:
   1. Design model is completed with 2-D ACADand 3-D Revit platforms for development of the Architectural, Structural and MEP construction documents.
   2. Level of Development for construction documents will include a Level 200 Model of the HVAC documents on drawing.
B. New Construction:
   1. Design model is completed with 2-D ACAD and 3-D Revit platforms for development of the Architectural, Structural and MEP construction documents.
   2. Level of Development for construction documents will include a Level 200 Model of the HVAC documents on drawing.

C. Clash Detection
   1. With various electrionic design modeling platforms utilized for design, clash detection and coordination of systems is limited to available 3-D information.
   2. Construction coordination cannot be electronic model dependent.
   3. Means and methods of coordination and installation of HVAC systems shall be the responsibility of the installing contractor.
   4. The design phase model clash detection includes design information available during the design phase for the systems at Level 200 as defined int the table.
   5. Contractors may utilize the design model for continuing construction clash detection for coordination of systems.
   6. Contractor shall be responsible for coordination and installation of the HVAC systems.
   7. Design intent must be maintained by the contractors as indicated in the construction documents.
   8. Contractor may adjust the installation locations of systems accordingly to maintain design intent during construction.
   9. Engineering team is not contracted to attend construction or clash detection meetings for the construction phase. Contact the engineer to identify any significant clashes which may impact the design intent for engineering review.

D. Level 200 Document
   1. Level 200 documentation will consist of three-dimensional (3D) models created in a BIM authoring software (generally Revit), and two-dimensional (2D) supporting documentation created in an AutoCAD Software (generally AutoCAD MEP).
   2. Available Deliverable formats are .rvt format, .dwg format and/or .pdf format. MEP coordination will be done through Navisworks by R&D, and is detailed in the "Coordination in Level 200 Documents" table.

| **HVAC Design Model - Level 200 Content** | | |
|---|---|---|
| **System** | **Size** | **Location** |
| HVAC Infrastructure Equipment | Generic | Approximate |
| Ductwork Mains | Generic | Approximate |
| Branch Ductwork & Air Diffusers<br>(Typical Rooms Modeled) | Generic | Approximate |
| Ductwork Accessories<br>(Specified & Drawn in 2D details) | N/A | N/A |
| Life Safety, Control Dampers, Terminal Equipment and Air Distribution | Generic | Coordinated with MEP |
| Control Sensors & Devices | Generic | Approximate |
| Equipment Service Clearances and Replacement Routes | Generic | Approximate |
| Piping Mains – Hydronic | Generic | Approximate |
| Branch Piping – Hydronic<br>(Typical Rooms Modeled) | Generic | Approximate |
| Specialty Distribution Piping & Systems – Refrigerant | Generic | Approximate |
| Piping Valves & Accessories<br>(Specified & Drawn in 2D details) | N/A | N/A |

| Coordination in Level 200 Documents | |
|---|---|
| **Item Included** | **Remarks** |
| MEP In Wall Coordination | Not Included |
| MEP Above Ceiling Coordination | Clashes of 5” or Greater will be coordinated in Equipment Rooms and MEP Intense Areas. |
| Coordination with Architectural Ceilings | Equipment rooms and MEP intense areas will be checked for clashes with ceilings |
| Coordination with Structural | Equipment rooms and MEP intense areas will be checked for clashes with Structural. |

| Not Included in Level 200 Documents | |
|---|---|
| **Item Not Included** | **Discipline(s)** |
| Supports and Anchors | Mechanical, Electrical, Plumbing |
| Automated Scheduling of Model Elements | Mechanical, Electrical, Plumbing |
| Design Calculations | Mechanical, Electrical, Plumbing |
| Main Conduit Feeders | Electrical |
| Branch Conduit | Electrical |
| Sprinkler Branch Piping | Plumbing |

### 1.21 DOCUMENTATION CONFLICTS

A. In the event of a conflict between the drawings and/or specifications, the Contractor shall base the bid on the greater quantity, cost or quality of the item in question.

## PART 2 PRODUCTS

### 2.1 ACCESS PANELS (STANDARD)

A. Refer to Specification Section 08 31 13 – Access Doors and Frames.
B. Size: adequate size to permit adjustment or service of concealed devices.
C. UL listed to conform to the fire rating of the surface it is installed in.

### 2.2 FIRESTOP MATERIALS

A. Refer to Specification Section 07 84 13 – Penetration Firestopping.
B. Firestopping materials shall be flexible and allow for normal duct and pipe movement.
C. Firestopping materials shall be moisture resistant,and shall not shrink upon drying.
D. Provide accessories such as backing materials, temporary forming materials, substrate primers, etc. as required and approved for the firestop system indicated.

E. Maximum flame spread and fuel contributed of 25 and smoke development of 50 when tested in accordance with ASTM E84.

## PART 3 EXECUTION

### 3.1 ACCESS PANELS

A. Provide access panels for access to equipment, dampers, valves, or other specialties installed behind wall or above ceiling surfaces.
B. Lay-in tee bar ceilings shall be considered adequate for access.
C. Confer with the other Project Contractors with respect to access panel locations and wherever practicable, group devices in such a manner so as to eliminate as many panels as possible.
D. Provide screwdriver operated latches for all access panels except the following specific exclusions:

| AREA SERVED | LATCH STYLE |
|---|---|
| Public Corridor Walls | Key Operated |
| Public Toilet Rooms | Key Operated |
| Hourly Rated Surfaces | As required by UL |

### 3.2 FIRESTOP MATERIALS

A. Firestop systems shall be a UL listed assembly.
B. Penetrations through fire and/or smoke rated construction shall be sealed to maintain the rating of the construction in which they occur.
C. Comply with the manufacturer's requirements for proper installation of firestop materials to obtain the required fire and/or smoke rating.

### 3.3 SYSTEM INTERRUPTION

A. Prior to interrupting any system operation, Contractor shall obtain approval for the interruption from the Owner.
B. All work, which can be done in advance of the service interruption, shall be completed and tested prior to connecting new systems to existing.
C. Coordinate service interruptions, with other trades requiring respective system shut-downs, to occur simultaneously to minimize the inconvenience to the Owner and occupants.

END OF SECTION

# SECTION 23 05 13 - MOTORS AND ELECTRICAL WORK

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Single phase electric motors.
B. Three phase electric motors.
C. Manual motor controllers.
D. Magnetic motor controllers.
E. Disconnect switches.
F. Fuses.

### 1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Motor Controllers.
B. Disconnect Switches.
C. Fuses.

### 1.3 REFERENCES

| | | |
|---|---|---|
| A. | AFBMA 9 - | Load Ratings and Fatigue Life for Ball Bearings. |
| B. | IEEE 112 - | Test Procedure for Polyphase Induction Motors and Generators. |
| C. | NEMA MG 1 - | Motors and Generators. |
| D. | NFPA 70 - | National Electrical Code. |
| E. | NEMA AB 1 - | Molded Case Circuit Breakers. |
| F. | NEMA ICS 2 - | Industrial Control Devices, Controllers and Assemblies. |
| G. | NEMA ICS 6 - | Enclosures for Industrial Controls and Systems. |
| H. | NEMA KS 1 - | Enclosed Switches. |

### 1.4 SUBMITTALS

A. Motor Product Data: Include following information with equipment which motor drives: Manufacturer, horsepower, voltage, phase, hertz, RPM, full load efficiency, power factor and project tailored wiring diagrams.
B. Motor Controller Product Data: Include following information with equipment which motor controller serves: Manufacturer, voltage, phase, hertz, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, installation, starting of product, mechanical connections, lubrication and wiring instructions.

### 1.5 CONTRACT CLOSEOUT SUBMITTALS

A. Operation Data: Include instructions for safe operating procedures.
B. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

### 1.6 QUALITY ASSURANCE

A. Conform to applicable electrical code, NFPA 70 and local energy code.
B. Listed and classified by Underwriters' Laboratories, Inc., as suitable for purpose specified and indicated.

C. Comply with IMC 602 and NFPA-70 for all devices, materials, and equipment located in return air or relief air plenums.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect motors and motor controllers stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. Remove motors from equipment and store separately for extended outdoor storage.

# PART 2 PRODUCTS

## 2.1 MOTORS

A. Manufacturers:
   1. General Electric.
   2. Marathon.
   3. Baldor.
   4. Approved equal.

B. General Construction and Requirements:
   1. Motors Less Than 250 Watts: Equipment manufacturer's standard and need not conform to these specifications.
   2. Type:
      a. Open drip proof except where specifically noted otherwise.
      b. Design for continuous operation in 40°C environment.
      c. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
   3. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
   4. Wiring Terminations:
      a. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
      b. Provide threaded conduit connection in end frame for fractional horsepower motors where a direct connection is made.

C. Single Phase Power – Permanent Split Capacitor Motors:
   1. Starting Torque: Exceeding one fourth of full load torque.
   2. Starting Current: Up to six times full load current.
   3. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50°C temperature rise) insulation, minimum 1.0 service factor, pre-lubricated sleeve or ball bearings, automatic reset overload protector.

D. Three Phase Power - Squirrel Cage Motors:
   1. Starting Torque: Between 1 and 1-1/2 times full load torque.
   2. Starting Current: Six times full load current.
   3. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
   4. Design, Construction, Testing, and Performance: General Duty motors conform to NEMA MG 1 for Design B motors.
   5. Insulation System: NEMA Class B or better.
   6. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.
   7. Motor Frames: NEMA Standard T Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
   8. Service Factor: 1.15 (minimum) for open drip-proof motors, 1.0 (minimum) for other types.
   9. Nominal Power Factor: Minimum 85% under rated load conditions.

10. Provide at each lubrication point, grease lubrication fittings at all grease lubricated motors.
11. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum AFBMA 9, L-10 life of 200,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
12. Sound Power Levels: To NEMA MG 1.
13. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.
14. Minimum Nominal Efficiency: ASHRAE 90.1 - 2007, Table 10.8b.
15. Additional requirements for all motors controlled by variable frequency drives:
    a. Motor Design: NEMA MG 1-31.
    b. Stator Insulation System: NEMA Class F.
    c. Shaft Grounding Ring Kits:
        1). Manufacturer: Aegis, Model SGR.
        2). Type: Maintenance free shaft grounding ring kits to protect motors and attached equipment from damaging shaft electrical currents at all motor speeds.
        3). Furnished and factory installed by equipment supplier.

## 2.2 MOTOR CONTROLLERS

A. Manufacturers:
    1. Allen Bradley.
    2. ABB.
    3. Cerus.
    4. Eaton Corporation.
    5. General Electric.
    6. Square D.
    7. Approved equal.

B. Motor Controllers:
    1. All motor controllers provided by same manufacturer unless integral part of equipment.
    2. General Construction and Requirements:
        a. Minimum AIC Rating: 22,000 RMS symmetrical amps at 600 VAC.
    3. Manual Controllers:
        a. NEMA ICS 2, AC general purpose Class A manually operated, full-voltage controller with quick made and break toggle action and double break silver alloy contacts.
        b. NEMA ICS, one piece bimetallic or melting alloy type thermal overload units. Controller shall be inoperative unless thermal units are in position. Omit for motors with built-in thermal overload protection.
        c. Provisions for resetting controller after thermal overload units trip controller.
        d. Green pilot light to indicate when motor is operating.
        e. Enclosure: NEMA ICS 6, general purpose flush mounted with stainless steel cover plate in finished areas and where indicated and Type 1 surface mounted in unfinished areas.
        f. Pad locking attachment for Type 1 enclosures.
    4. Magnetic Controller:
        a. NEMA ICS 2, AC general purpose Class A magnetic across-the-line for induction motor rated in horsepower.
        b. Contacts: Double break silver alloy, replaceable from front of controller without removing power wiring or controller from enclosure, straight-through wiring.

c. Coils: Molded construction removable from front of controller without removing controller from enclosure.
d. Overload Relay: NEMA solid state with user selectable settings, Class 10, 20, and 30; built-in memory to prevent hot motor restart.
1). Visible trip indicator.
2). Operating temperature: -20°C to +70°C.
3). Phase current loss protection.
4). Phase current unbalance protection (adjustable 20-50%).
e. Auxiliary Contacts: One (1) normally open isolated auxiliary contact and one (1) normally closed auxiliary contact.
f. Enclosure: NEMA ICS 6, Type 1 unless indicated otherwise on motor control schedule.
g. Coil operating voltage: 120V, 60 Hz.
h. Control power transformers: 120V, 60 Hz, secondary, 100VA fused minimum, in each motor starter. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.
i. Provide following accessories when indicated on Drawings.
1). Pushbuttons: Unguarded type.
2). Pilot lights: LED type, green-run.
3). Hand-Off-Auto selector switches: Rotary type.
5. Combination controllers:
a. Where a magnetic motor controller and disconnect are scheduled, combine magnetic controller with pad lockable non-fusible disconnect switch in common enclosure complying with disconnect switch requirements below.

## 2.3 DISCONNECT SWITCHES

A. Manufacturers:
1. Allen Bradley.
2. Eaton Corporation.
3. Square D.
4. General Electric.
5. Approved equal.
B. General Construction and Requirements:
1. Minimum AIC Rating: 22,000 RMS symmetrical amps at 600 VAC.
C. Fusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle pad lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.
D. Non-fusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle pad lockable in OFF position.
E. Enclosures:
1. Indoor: NEMA KS 1; Type 1; code gauge steel with rust inhibiting primer.
2. Outdoor: NEMA KS 1; Type 3R; code gauge zinc coated steel with baked enamel finish or Type 4 when indicated on the drawings.
3. Corrosive Areas: NEMA KS 1; Type 4X; 304 stainless steel with brushed finish.

## 2.4 FUSES

A. Furnish fuses in accordance with Division 26 electrical specifications.

## PART 3 EXECUTION

### 3.1 MOTOR APPLICATION

A. Verify voltage with Electrical Contractor before ordering.
B. Motors located in exterior locations or draw thru air handling units: Totally enclosed fan cooled.

### 3.2 MOTOR INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
C. Check line voltage and phase and ensure agreement with nameplate.

### 3.3 MOTOR CONTROLLER AND DISCONNECT SWITCH INSTALLATION

A. Responsibilities of Division 23:
   1. Furnish the following equipment and give to Division 26 for installation and wiring:
      a. Motor controllers.
      b. Disconnect switches.
      c. Fuses.
      d. Heater elements for eutectic alloy type overload relays.
B. Responsibilities of Division 26:
   1. Install all motor controllers and disconnect switches furnished by Division 23 in accordance with manufacturer's instructions.
   2. Mounting Height: 5 ft. to operating handle.
   3. Overload Relays for Motor Controllers:
      a. Electronic Type: Adjust solid state overload relay settings to match installed motor characteristics.
      b. Eutectic Alloy Type: Determine required heater element sizes and notify Division 23. Install all heater elements.
   4. Install fuses furnished by Division 23 in fusible disconnect switches.
   5. Maintain code service clearances.
   6. Provide engraved nameplate on outside cover of each motor controller and disconnect switch door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

END OF SECTION

# SECTION 23 05 14 - VARIABLE FREQUENCY DRIVES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Variable Frequency Drives (VFDs) serving fan motors.

### 1.2 REFERENCES

| | | |
|---|---|---|
| A. | ANSI/IEEE 519 - | Guide for Harmonic Control and Reactive Compensation of Static Power Convertors. |
| B. | IEC 61800-3 - | International Electrotechnical Commission, Adjustable Speed Electrical Power Drive Systems. |
| C. | NEMA 250 - | Enclosures for Electrical Equipment. |
| D. | NFPA 70 - | National Electric Code. |
| E. | ANSI/UL Standard 508 - | UL Standard for Safety Industrial Control Equipment. |

### 1.3 SUBMITTALS

A. Project Data: Physical, electrical, and performance characteristics of each variable frequency drive and associated components, including:
   1. Dimensions and weight.
   2. Input and output performance.
   3. Voltage, phase, current and overcurrent characteristics.
   4. Short circuit current ratings.
   5. Installation instructions.
   6. Protective features.
   7. Wiring and block diagrams indicating specified options.
   8. Certified efficiency versus load and speed curves.
   9. Required operating environment.

### 1.4 CONTRACT CLOSEOUT SUBMITTALS

A. Maintenance Data: Include recommended maintenance procedures, maintenance schedules, recommended spare parts list, and vendor name for those parts. Test and start-up report.

### 1.5 QUALITY ASSURANCE

A. Performance: Test VFDs and all options in accordance with UL standard 508.
B. Listing of Complete System Including all Options: UL or C-UL listed.
C. Minimum Short Circuit Rating: UL listed for interrupting rating of 100,000 RMS symmetrical amps at 600 VAC.
D. Comply with IMC 602 and NFPA-70 for all devices, materials, and equipment located in return air or relief air plenums.
E. Seismic Certification: Comply with requirements of the International Building Code for all components.
F. Supplier/Manufacturer: Use same supplier/manufacturer for all VFDs.

### 1.6 IEEE 519 COMPLIANCE

A. Total harmonic distortion: Maximum of 5% current or voltage distortion at electrical power input of each VFD.

B. Submit calculations showing compliance with IEEE 519 and total harmonic distortion caused by all VFDs included on the project. Base calculations on information obtained from local utility power provider and from electrical contract drawings. It is the responsibility of the VFD manufacturer to obtain all information required.
C. Provide all additional line reactors or filters needed for IEEE 519 compliance at no additional cost to the owner.

## 1.7 WARRANTY

A. Provide all VFDs with manufacturer warranty for a period of 24 months from date of shipment. Include parts, labor, travel costs and living expenses incurred by manufacturer to provide factory authorized service.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

A. Asea Brown Bovari.
B. Danfoss.
C. Yaskawa.
D. General Electric.
E. Franklin.
F. Approved equal.

## 2.2 SELECTION AND RATINGS

A. Rated for horsepower and voltage scheduled for motor being driven. Select drive such that motor full load amps do not exceed continuous current rating of drive.
B. Fundamental Power Factor: Not less than .95 over entire range of speed and load.
C. Minimum Efficiency: 95% at full load and 85% at half load.
D. Operating Ambient Conditions: 32°F to 104°F, less than 95% R.H., non-condensing. Derate drives if continuous operation is not permissible under these conditions.
E. Altitude: Up to 3300 feet above sea level. Derate drives above this altitude.

## 2.3 DESIGN AND CONSTRUCTION

A. Variable torque, solid state, pulse width modulated (PWM) VFD with full wave rectifier, DC line reactor capacitors and insulated gate bipolar transistors (IGBT) as the output switch device.
B. Filters for Electromagnetic and Radio Frequency Interferences: Include for all VFDs complying with IEC 61800-3.
C. NEMA 250 Type Enclosure:
   1. Type 1 indoors, Type 3R outdoors.
   2. Wall mounted or free standing, with hinged and lockable door.
   3. Partition enclosure to separate and isolate drives with bypass section from drive section so that drive section can be serviced without live power in drive section.
D. Display:
   1. Alpha-numeric, LCD, mounted on front cover.
   2. Capable of indicating all setup parameters, indications, faults, and warnings in words. Keypad for adjusting parameters.
   3. Separate status indicators for overcurrent, overvoltage, ground fault, over-temperature and input power.
E. Restart:
   1. Manual or automatic as scheduled.
   2. Automatic after overcurrent, overvoltage, undervoltage or loss of input signal protective trip.

3. Minimum five (5) restart attempts; and programmable trial time.

F. Flying Start: VFDs capable of starting into a rotating load and accelerate or decelerate to setpoint without safety tripping and without damaging the VFD or motor.

G. Terminal Strip: Isolated from wire to ground.

H. Disconnects:
1. Non-fused disconnect switch interlocked with door handle, pad lockable, to disconnect all input power upstream of VFD and bypass motor controller.
2. Interrupting rating of 100,000 RMS symmetrical amps at 600 VAC.

I. Separate "Hand-Off-Auto" switch.

J. Adjustments:
1. Three (3) programmable critical frequency lockout ranges.
2. Two (2) programmable analog inputs (0-20 mA or 0-10V), isolated from ground, for speed reference; include filter, programmable from 0.01 to 10 seconds, to remove oscillation in input signal.
3. Six (6) programmable digital inputs for interfacing with building automation system.
4. Two (2) programmable analog outputs proportional to frequency, motor speed, output voltage, motor torque, power or DC box voltage.
5. Two (2) programmable digital relay outputs rated for maximum switching current of 8 amps at 24 VDC and 0.4 amps at 250 VAC.
6. Manual speed adjustment using keypad mounted on door.

K. Overload Rating: 110% of VFD variable torque current rating for 1 minute every 10 minutes and 115% for 2 seconds every 10 seconds.

L. Current Limits Circuits:
1. Slow current limit circuit adjustable from 50% to 110% of the VFD's variable torque current rating.
2. Rapid current regulations limit fixed at 140% of VFD's variable torque current ratings.
3. Current switch-off limits fixed at 150% of VFD's variable torque current rating.

M. Protection:
1. Overcurrent trip 200% of VFD's variable torque current rating.
2. Overvoltage trip 130% of VFD's rated voltage.
3. Undervoltage trip 60% of VFD's rated voltage.
4. Ground fault.
5. Electronic motor overload protection programmable for specific motor characteristics.
6. Input fuses.

N. Interlock Terminal Strip: Separate terminal strip for connection of freeze, fire and smoke contacts and external start/stop command. Maintain all external interlocks fully functional whenever the VFD is in hand, auto or bypass mode.

O. Bypass Motor Controllers:
1. Factory wired and tested bypass system consisting of two contactor bypass and motor controller to operate the motor with line power when servicing the VFD.
2. Built-in motor controller with either across the line start or soft start as scheduled on the “Equipment Electrical Schedule” on the drawings. Comply with requirements of Section 23 05 13.
3. Provide service switch and fuses upstream of the VFD for ability to replace or repair the VFD components when operating the motor in the bypass mode.
4. Phase protection of motor when operating in bypass mode.
5. Key pad adjustment for selecting “Manual” or “Automatic” transfer to bypass. Coordinate with owner’s project representative for desired adjustment mode setting.
6. Designed for standalone operation when keypad selector switch is in “Hand” or “Automatic”. Maintain serial communications while operating in bypass mode even if the VFD is removed for service.
7. Omit bypass motor controllers for VFDs as designated on the “Equipment Electrical Schedule” on the drawings.

P. Line Reactors: 5% minimum impedance to reduce harmonic current and voltage distortion, at input to each VFD, in the form of a swinging DC bus choke, or internal AC line reactors or a combination of the two.

Q. Control System Interface:
Provide each VFD with a communications port that interfaces with the facilities management system. Coordinate required communications protocol with the successful temperature controls contractor.
1. As a minimum, provide the following adjustable control points:
   a. VFD Start/Stop.
   b. Speed Reference Signal.
   c. Output Signal:
      1). Frequency.
      2). RPM.
   d. Current.
   e. Heatsink (Drive) Temperature.
   f. Runtime.
   g. DC Bus Voltage.
   h. Fault Codes.
   i. Kilowatt.
   j. Bypass Motor Controller Status.

## PART 3 EXECUTION

### 3.1 GENERAL

A. Responsibilities of Division 23:
1. Furnish the following equipment and give to Division 26 for installation and wiring:
   a. VFD's (if not unit mounted).
   b. Heater elements for eutectic alloy type overload relays.
   c. Fuses shipped loose.
2. Speed control signal from temperature controls must be isolated and wired with shielded cable.
3. Provide dedicated conduits for control wiring.

B. Responsibilities of Division 26:
1. Install all VFDs furnished by Division 23 in accordance with manufacturer's instructions (if not unit mounted).
2. Do not install VFDs until building environment is within manufacturer's required service conditions.
3. Support wall mounted VFDs on wall or "Uni-Strut support system. Do not mount VFDs on air handling unit casings.
4. Mounting Height: 5 ft. to operating handle.
5. Overload Relays for Bypass Motor Controllers:
   a. Electronic Type: Adjust solid state overload relay settings to match installed motor characteristics.
   b. Eutectic Alloy Type: Determine required heater element sizes and notify Division 23. Install all heater elements.
6. Install fuses furnished by Division 23 in VFDs.
7. Maintain code service clearances.
8. Provide engraved nameplate on outside cover of each VFD door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.
9. Provide dedicated conduits for power wiring.
10. For each VFD, provide separate ground wires for input power wiring to VFD and output power wiring to motor. Run both ground wires to VFD ground lug. Do not use conduits as ground.

## 3.2 START-UP SERVICE

A. Provide start-up service by a factory trained and certified service technician. Verify correct installation, start-up the drive system, and check for proper operation. Submit a test and start-up report included in O & M manuals with one copy going to design engineer.
B. Demonstrate operation of controllers in automatic and bypass modes.
C. Provide four (4) hours of training to Owner's Representative.

END OF SECTION

# SECTION 23 05 29 - SUPPORTS AND ANCHORS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Pipe, ductwork, equipment, conduit hangers, supports, and anchors.
B. Roof pipe curbs.
C. Roof equipment, pipe and duct support rails.
D. Equipment pipe stands.
E. Concrete pads and curbs.
F. Interior wall and floor pipe penetrations.
G. Exterior wall pipe penetrations.
H. Corrosive atmosphere coatings.

### 1.2 REFERENCES

A. ASME B31.1 - Power Piping.
B. ASME B31.9 - Building Services Piping.
C. MSS SP58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
D. MSS SP69 - Pipe Hangers and Supports - Selection and Application.
E. ASTM A36.
F. ASTM A307.
G. ASTM A500.
H. ASTM A572.
I. ASTM 615.
J. ASTM C1107.
K. ASTM C150.
L. ASTM A185.
M. ASTM D 2000.

### 1.3 SUBMITTALS

A. Product Data: Schedule of all hanger and support devices indicating shields, attachment methods and type of device for each pipe size and type of service.
B. Manufacturer's catalog data for all curbs and bases, and pre-fabricated pipe penetrations.
C. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

### 1.4 QUALITY ASSURANCE

A. Conform to applicable code for support of piping.
B. Coordinate work with roofing contractor and adhere to any roof warranty requirements.

## PART 2 PRODUCTS

### 2.1 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Anvil.
   2. B-Line.
   3. Michigan Hanger.
   4. Uni Strut.

5. Piping Technology and Products.
6. Power Strut.

B. Conformance:
1. ASME B31.9, MSS SP-58 and MSS SP-69.

C. Hangers:
1. Carbon steel, adjustable swivel ring, or adjustable clevis. MSS SP-69 Type 10 or Type 1.
   a. All pipes 1-1/2” and under.
2. Carbon steel, adjustable clevis, MSS SP-69 Type 1.
   a. Refrigerant: 2” and over.

D. Multiple or Trapeze Hangers:
1. Strut of structural steel channels with welded spacers and hanger rods.
   a. Refrigerant.

E. Wall Support:
1. Carbon steel hook.
   a. All pipes 2” and under.
2. Welded steel bracket MSS SP-69 Type 32 or 33 and steel clamp.
   a. Refrigerant: 2-1/2” and over.

F. Vertical Support: Steel riser clamp, MSS SP-69 Type 8.

G. Floor Support:
1. Cast iron adjustable pipe saddle, lock nut and nipple, MSS SP-69 Type 38, floor flange and concrete pier or steel support.
   a. Refrigerant.

H. Accessories:
1. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded, black or zinc plated finish with adjusting locknuts.
2. Saddles: Curved carbon steel plate, MSS 69, Type 39A or 39B, sized for insulation thickness.
3. Shields: Galvanized, carbon steel, 2 round, MSS 69, Type 40.
4. Beam Clamps:
   a. Pipe size 4” and less: MSS SP-69 Type 23 malleable black iron clamp with a hardened steel cup point set screw.
   b. Pipe size 5” thru 8”: MSS SP-69 Type 28 or Type 29 forged steel jaw type clamp with a tie rod suitable for rod sizes to 1-1/2” diameter.
5. Structural and miscellaneous steel:
   a. Angles, channels, and beams: ASTM A36 and A572 as required.
   b. Tubing: ASTM A500 Grade B.
   c. Unfinished bolts: ASTM A307, Grade A, length required with no threads in contact with bearing surfaces, fitted with self-locking nuts and washers.
6. Concrete Inserts:
   a. MSS SP-69 Type 18 wedge type or universal concrete inserts for pipes 8” and under.
   b. Wedge type: Black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8” diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity.
   c. Universal type: Black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8” diameter.
   d. Use drilled steel shell with plug type inserts when the inserts are placed after the concrete is poured.
7. Continuous Concrete Insert Channels:
   a. Steel inserts with an industry standard pre-galvanized finish, nominally 1-5/8” wide by 1-3/8” deep by length to suit the application, designed to be nailed to concrete forms and provide a linear slot for attaching other support devices.
   b. Load rating: 2000 pounds per foot in concrete.

c. Manufacturer's standard brackets, inserts, and accessories designed for the channel inserts may be used.
d. Insert length to accommodate all pipe, duct, and conduit in the area.

## 2.2 CONDUIT HANGERS AND SUPPORTS

A. Coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split anchors.

## 2.3 ROOF PIPE CURBS

A. Manufacturers:
1. Custom Curb.
2. Pate.
3. Roof Products and Systems.
4. ThyCurb.
5. Vent Products.

B. Curb Construction:
1. Continuously welded, 18 gauge, galvanized steel shell.
2. Integral base plate.
3. 3 lb. density, 1-1/2" thick rigid insulation.
4. 2" x 2" treated wood nailer.
5. Compensate for roof pitch for level installation.

C. Minimum height above deck, 12".

D. Cover: Acrylic clad thermoplastic cover, galvanized fastening screws, graduated step boots with stainless steel clamps.

## 2.4 ROOF EQUIPMENT, PIPE AND DUCT SUPPORT RAILS

A. Manufacturers:
1. Custom curb.
2. Pate.
3. Roof Product and Systems.
4. ThyCurb.
5. Vent Products.

B. Height:
1. Duct and pipe: 18" high unless noted otherwise.
2. Equipment: Based on length of longest support rail, the height of the bottom of the equipment shall be as follows:

| LENGTH OF SUPPORT RAIL | MINIMUM HEIGHT OF BOTTOM OF EQUIPMENT ABOVE ROOF |
|---|---|
| Up to 24" | 18" |
| 25" - 36" | 22" |
| 37" - 48" | 28" |
| 49" - 60" | 34" |
| 61" and over | 40" |

C. Welded 18 gauge galvanized steel shell, integral base, pressure treated wood nailer, galvanized steel counterflashing with lag screws sized to accept 1-1/2" insulation.

D. Support Rails 30" or more in Height: 24" high rail with galvanized pipe supports and structural steel members attached to top of rail.

E. Duct and Pipe Supports:
1. Galvanized steel channel track attached to rail.
2. Vertical and horizontal support, galvanized steel fittings, washers and nuts.
3. Provide for horizontal and vertical adjustment.
4. Painted steel roller for pipe support.

## 2.5 EQUIPMENT PIPE STANDS

A. Contractor fabricated stand consisting of structural steel members supported by pipe supports.
B. Hot dipped galvanized after fabrication where exposed to weather or indicated.
C. Provide base or anchor plates to transfer and anchor stand to supporting structure.
D. Anchor floor or wall supports to structure.
E. Anchors shall be rated to meet supporting weight requirements.

## 2.6 CONCRETE PADS AND CURBS

A. Concrete:
   1. Design mix (strength at 28 days): 3500 PSI, 3/4” mix aggregate, 2” - 4” slump.
   2. Portland Cement: ASTM C150, Type 1.
   3. Water: Potable.
   4. Welded Wire Mesh: ASTM A185, 6 x 6-W1.4 x W1.4.
   5. Re-bars: ASTM A615 grade 60.
B. Grout:
   1. ASTM C1107. Grade B, non-shrink, non-metallic, post-hardening, volume adjusting, dry, hydraulic-cement-type grout.
   2. Non-staining, non-corrosive, non-gaseous.
   3. Suitable for both interior and exterior.
   4. Design mix: 5000 psi, 28 day compressive strength.

## 2.7 INTERIOR WALL AND FLOOR PIPE SLEEVES

A. Material: 18 gauge galvanized steel or steel pipe.
B. Diameter: One inch larger than outside diameter of the pipe, conduit or pipe insulation.
C. Length: Sufficient length to pass thru wall or floor. Sleeves in Mechanical Room floors shall extend 6” above finished floor.

## 2.8 PIPE PENETRATIONS THROUGH EXTERIOR WALLS

A. Manufacturers:
   1. Thunderline Link-Seal.
B. Modular, mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and wall opening, elastomeric element sized and selected per manufacturers recommendations and have the following properties:
   1. -40°F to 250°F: EPDM, ASTM D2000 M3 BA510.
   2. -67°F to 400°F: Silicone, ASTM D2000 M1 GE505.
C. Sleeves:
   1. New concrete walls and floors: Pre-formed HPDR thermoplastic, integral water stop and reinforcing ribs, nailer end caps.
   2. Existing concrete walls and floors: Core-drilled opening.
   3. Masonry walls: Schedule 40 steel pipe grouted in place.

## 2.9 CORROSIVE ATMOSPHERE COATINGS

A. Factory coat supports and anchors used in corrosive atmospheres with hot dip galvanizing after fabrication, ASTM A123, 1.5 ounces/square foot of surface, each side. Mechanical galvanize threaded products, ASTM B695 Class 150, 2.0 mil coating. Field cuts and damaged finishes to be field covered with zinc rich paint of comparable thickness to factory coating.
B. Corrosive atmospheres include the following locations:
   1. Exterior locations.
   2. Chemical storage rooms.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide all supporting steel, not indicated on drawings, that is required for installation of mechanical equipment and materials, including angles, channels, beams, etc.

### 3.2 PIPE HANGERS AND SUPPORTS

A. Size hangers for insulated piping to accommodate thickness of insulation.
B. Pipe hangers shall be spaced in accordance with the following schedule:

| PIPE SIZE | MAX. SPACING BETWEEN HANGERS | |
|---|---|---|
| | STEEL AND COPPER PIPING | PVC PIPING |
| ½" | 4' | 4' |
| ¾" | 5' | 4' |
| 1" | 6' | 5' |
| 1-1/4" | 8' | 5' |
| 1-1/2" | 8' | 5' |
| 2" | 8' | 6' |
| 2-1/2" | 9' | 6' |
| 3" | 10' | 7' |
| 4" | 14' | 7' |
| 5" | 16' | 7' |
| 6" | 16' | 9' |
| 8" | 18' | 9' |

C. Install hangers to provide minimum 2" space between finished covering and adjacent work.
D. Place hangers within 12" of each horizontal elbow.
E. Use hangers with 1-1/2" minimum vertical adjustment.
F. Support vertical piping at every floor.
G. Provide multiple or trapeze hangers where several pipes can be installed parallel and at same elevation.
H. Support riser piping independently of connected horizontal piping.
I. Isolate copper piping from dissimilar metal hangers and supports by means of felt, plastic, or epoxy coatings.
J. Design hangers for pipe movement without disengagement of supported pipe.
K. Adjust hangers to obtain the slope specified.
L. Install saddles on all hot piping 2-1/2" and larger which does not require a vapor barrier; fill interior voids with segments of insulation that match adjoining pipe insulation.
M. Provide insulation protection shields on all piping 2" and smaller and all cold piping 2-1/2" and larger.
N. Construct anchors from structural steel as detailed.
O. Prime coat exposed steel hangers and supports in following locations:
   1. Tosa Room (Ice House).
P. Provide hangers, rods, and accessories hot dipped galvanized after fabrication in the following locations:
   1. Exposed to weather.

## 3.3 INSERTS

A. Provide inserts 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”.
D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

## 3.4 CONDUIT HANGERS AND SUPPORTS

A. Arrange supports to prevent misalignment during wiring installation.
B. Minimum of one hanger per 8 feet of conduit.
C. Group related conduits; support using steel channel conduit rack.

## 3.5 ROOF RAILS AND CURBS

A. Turn curbs over to the appropriate Contractor for installation (turnover point shall be on the roof at point of installation).

## 3.6 EQUIPMENT PIPE STANDS

A. Provide fabricated stands to support equipment per manufactures installation requirements.
B. Provide equipment stands for:
   1. Grade mounted condensing units.
   2. Equipment provided by vendor requiring field support.
   3. Where detailed.
C. Brace and fasten supports with anchor plates or flanges bolted to structure.

## 3.7 CONCRETE PADS AND CURBS

A. Provide concrete pads for:
   1. HVAC floor supported equipment.
   2. Where detailed.
B. Provide concrete housekeeping pads nominal 4” thick unless otherwise indicated extending 6” beyond equipment footprint.
C. Provide 1” chamfer on all concrete pads.
D. Bond pads and curbs to concrete slabs with hooked dowel rods.
E. Reinforcement:
   1. Pads: Welded wire mesh with minimum 1” cover.
   2. Curbs: Rebar with minimum 1” cover.
F. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
G. Brace and fasten supports with flanges bolted to structure.

## 3.8 INTERIOR WALL AND FLOOR PENETRATIONS

A. Piping and Conduit:
   1. Thru walls where drywall or masonry does not extend to structure: No special requirements.
   2. Thru walls where drywall, concrete, or masonry extends to structure and thru floors:
      a. For new concrete walls and floors, furnish and install sleeves.
      b. For new masonry walls, furnish sleeves to the appropriate contractor for installation.
      c. For new fire rated drywall walls, furnish and install sleeves.
      d. For non-rated drywall walls, no sleeve is required.

e. For existing masonry walls, provide sleeve and grout sleeve in wall.
f. Fill void between pipe or insulation and walls, floor or sleeve with mineral wool.
g. Non-rated walls and floors: Caulk both sides with non-hardening caulk.
h. Rated walls and floors: Caulk both sides with minimum 1” deep firestop material.

B. Install chrome plated steel escutcheons at penetrations exposed in finished rooms.

## 3.9 PIPE DUCT & EQUIPMENT HANGERS AND SUPPORTS AT AREAS DESIGNATED TO RECEIVE SPRAY-ON FIREPROOFING

A. Secure all hangers, support members, beam clamps, intermediate support steel, etc., which is required to suspend piping, ductwork and equipment from the framing system designated to receive spray-on fireproofing, before the spray-on material is applied.
B. After the spray-on material is applied, complete the installation of the suspension components, and then install the pipe, ductwork and equipment.
C. This Contractor shall be responsible to determine the areas specified to receive spray-on fireproofing, and schedule work accordingly.
D. This Contractor shall not be allowed to remove any sprayed-on fireproofing in order to attached hinges and supports.
E. For areas where sprayed-on fireproofing is in place, coordinate work with General Contractor for removal and reinstallation of fireproofing.

END OF SECTION

## SECTION 23 05 48 - VIBRATION ISOLATION

### PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Bases.
B. Vibration isolators.
C. Flexible pipe connectors.

### 1.2 PERFORMANCE REQUIREMENTS

A. Use materials that will retain their isolation characteristics for the life of the equipment served. Use industrial grade neoprene for elastomeric materials.
B. Hot dip galvanize, apply a neoprene coating on, or use stainless steel parts for isolation devices exposed to the weather or used in high humidity areas; include limit stops to resist wind.
C. Select isolator deflection so the natural frequency is 40% or less than the lowest operating speed of the equipment. Lowest operating speed shall take into account modulation of variable frequency drives and two-speed motors.
D. Consider equipment weight distribution to provide uniform isolator deflections.

### 1.3 SUBMITTALS

A. Shop Drawings: Indicate inertia bases and locate vibration isolators, with static and dynamic load on each.
B. Product Data: Provide schedule of vibration isolator type with location and load on each.
C. Manufacturer's Installation Instructions: Indicate special procedures and setting dimensions.

### 1.4 DESIGN REQUIREMENTS

A. Select base and vibration isolation device as indicated below. Minimum deflection as listed and not less than 95% isolation efficiency.

| TYPE OF EQUIPMENT | ON GRADE | | | ON SUPPORTING STRUCTURE | | | | |
|---|---|---|---|---|---|---|---|---|
| | Isolation Type | Base Type | Minimum Deflection (Inches) | Isolation Type | Base Type | Minimum Deflection (in.) Floor Span or Column Spacing 20’ | 30’ | 40’ |
| Air-Cooled Condensing Units | | | | | | | | |
| Screw/Rotary/Scroll | 1 | – | 0.25 | 3 | – | 0.75 | 0.75 | 0.75 |
| Axial, Plenum, Cabinet, and Centrifugal Inline Fans(4)(8) | | | | | | | | |
| Up to 22” diameter | 2 | B | 0.25 | 3 | B | 0.75 | 0.75 | 0.75 |
| 24” diameter & over | | | | | | | | |
| Up to 2” W.C. TSP(7) | | | | | | | | |
| Up to 300 RPM | 3 | B | 2.50 | 3 | C | 3.50 | 3.50 | 3.50 |
| 301 to 500 RPM | 3 | B | 0.75 | 3 | B | 1.50 | 2.50 | 2.50 |
| 501 RPM & over | 3 | B | 0.75 | 3 | B | 1.50 | 1.50 | 1.50 |
| 2.1” W.C. TSP(7) & over | 3 | C | 2.50 | 3 | C | 3.50 | 3.50 | 3.50 |

| TYPE OF EQUIPMENT | ON GRADE | | | ON SUPPORTING STRUCTURE | | | | |
|---|---|---|---|---|---|---|---|---|
| | Isolation Type | Base Type | Minimum Deflection (Inches) | Isolation Type | Base Type | Minimum Deflection (in.) Floor Span or Column Spacing 20’ | 30’ | 40’ |
| Axial and Tubular Centrifugal Fans | Use same isolators and bases as for centrifugal fans. | | | | | | | |
| Suspended Centrifugal Fans | Use type 5 isolator with deflection from floor-mounted centrifugal fan chart. | | | | | | | |
| Packaged Air Handling Units - Without internal fan isolation | Use same isolator (without base) and deflections as for centrifugal fans. | | | | | | | |
| Packaged Rooftop AC Unit | 3 | D | 0.75 | 3 | D | 0.75 | 1.50 | 2.50 |
| Piping | First three hangers for piping connected to vibrating equipment listed above and in-line pumps shall be Type 6 with same deflection as equipment or 2" whichever is less. The remaining hangers, within 50' of equipment, shall be Type 5 with a 0.75" deflection. Where piping is supported from the floor, use Type 4 in place of Type 6, and Type 3 in place of Type 5 hangers. | | | | | | | |

Notes for the above table:

(1) Add a minimum 0.75” Type 1 isolation to the base plate of the required spring isolator.
(2) Concrete inertia bases shall be sized for a minimum pad thickness equal to the greater of 1/10th the longest dimension or;
  (a) 6” thick if the pump is less than 30 hp.
  (b) 8” thick if the pump is less than 75 hp.
  (c) 12” thick if the pump is up to 100 hp.
(3) Provide supplemental bracing, snubbers, or limit stops as needed for wind loading conditions.
(4) For all roof mounted fans change provide Type 4 isolators with the specified minimum deflection in lieu of the Type 3 isolator.
(5) Provide thrust restraints for fans operating with a total static pressure of 2” or greater. Thrust restraints shall utilize Type 5 isolators with a deflection of 0.25”.
(6) Provide inertia bases for all Class 2 and Class 3 fans.
(7) TSP in the chart above refers to the fan’s total static pressure.
(8) For fans with fan wheel tip speeds in excess of 10,000 FPM add a minimum 0.75” Type 1 isolation to the base plate of the required spring isolator.

## PART 2 PRODUCTS

### 2.1 BASES

A. Manufacturers:
  1. Peabody.
  2. Mason.
  3. Amber/Booth.
  4. Vibration mountings and controls.

B. Structural Bases (Type B):
  1. Base frame assembly: Structural member sections with a depth not less than 1/10 of the longest dimension of the base, but not less than 4"; base depth need not exceed 12", except where structural or alignment considerations dictate otherwise.
  2. Base clearance: Minimum one inch above the floor or housekeeping pad using welded on isolator support brackets.

C. Concrete Bases (Type C):
   1. Construction: 3000 PSI concrete cast into a rectangular prefabricated inertia base frame assembly.
   2. Base frame assembly: Structural member frame with a depth not less than 1/10 of the longest dimension of the base, but not less than 6"; base depth need not exceed 12", unless it is specifically required for mass rigidity, or component alignment.
   3. Miscellaneous accessories: 1/2" reinforcing bars on minimum 8" centers both ways, relocated equipment anchoring bolts, and recessed isolator brackets.
   4. Bases used for base-mounted pumps shall be large enough to support piping elbows.
D. Curb Mounted Base (Type D):
   1. Manufacturers:
      a. Mason.
      b. Thycurb.
   2. Construction:
      a. Lower member: Rectangular steel tube containing adjustable and removable springs that support the upper floating section; springs shall rest on 1/4" neoprene acoustical pad.
      b. Upper frame: Designed to provide continuous support for the equipment.
      c. Hardware: Cadmium plated or galvanized.
   3. Continuous flexible aluminum weatherproofing seal joined at the corners by EPDM bellows, and nailed to the curbs waterproofing.
   4. Spring access ports with waterproof covers at the spring location.

## 2.2 VIBRATION ISOLATORS

A. Manufacturers:
   1. Peabody
   2. Mason
   3. Amber/Booth
B. Neoprene Pads
   1. Neoprene Pad (Type 1):
      a. Stiffness: 40-45 durometer.
      b. Ribbed or waffled on both surfaces.
      c. Steel shim plates between layers when multiple layers are required.
   2. Neoprene Pad (Type 2):
      a. Oil-resistant neoprene material.
      b. Non-skid ridged top and bottom surfaces.
      c. Minimum 0.35 inches static deflection.
      d. Provide bolt holes for bolting to floor where required.
C. Springs:
   1. Spring lateral stiffness greater than .75 times the rated vertical stiffness.
   2. Spring travel 50% beyond rated load.
   3. Spring Isolator (Type 3):
      a. Free standing, unhoused, laterally stable with neoprene friction base.
      b. Leveling bolts for securing to the equipment.
   4. Restrained Spring Isolators (Type 4):
      a. Springs assembled into formed or welded steel housing assemblies designed to limit vertical movement of the supported equipment, with a neoprene friction pad.
      b. Leveling bolts for securing to equipment.
   5. Spring Hanger (Type 5):
      a. Steel spring in series with a minimum 0.3" elastomer insert assembled in a steel bracket.
      b. Hanger support rod misalignment through a 30° arc without metal-to-metal contact or other short circuit.

6. Pre-Compressed Spring Hanger (Type 6):
   a. Same as Type 5 but spring preloaded with release mechanism to free the spring after the installation is complete.

## 2.3 FLEXIBLE PIPE CONNECTORS

A. Metal Hose:
   1. Manufacturers:
      a. Flexonics.
      b. Hyspan.
      c. Metraflex.
      d. Twin City Hose.
   2. Joint: As specified for pipe joints.
   3. Maximum Offset: 1 inch on each side of installed center line.
   4. Length: Minimum 12" or as required to provide specified offset.
   5. Steel Piping:
      a. Inner Hose: Stainless steel.
      b. Exterior Sleeve: Single or double braided stainless steel as required for pressure rating.
      c. Pressure Rating:
         1). 125 psi WSP and 450°F.
   6. Copper Piping:
      a. Inner Hose: Bronze.
      b. Exterior Sleeve: Braided bronze.
      c. Pressure Rating:
         1). 125 psig WSP and 450°F.
   7. Applications:
      d. Refrigerant piping systems.
      e. Natural gas systems.

# PART 3 EXECUTION

## 3.1 INSTALLATION

A. Install vibration isolation devices and bases:
   1. Where detailed and scheduled.
   2. Where required by equipment manufacturer.
   3. In accordance with the manufacturer's instructions.
B. Install spring isolators without binding.
C. Installation shall not short circuit any isolation devices.
D. Install flexible pipe connectors on the equipment side of isolation valves.
E. Flexible pipe connectors shall be properly pre-extended as recommended by the manufacturer to prevent additional elongation under pressure.
F. Prime and paint exposed structural steel of Type B and C bases.

## 3.2 FLEXIBLE PIPE CONNECTORS

A. Provide metal hose flexible pipe connectors at the following locations:
   8. Air-cooled condensing units.
   9. Where detailed.
   10. Where required by equipment manufacturer.

END OF SECTION

# SECTION 23 05 53 - MECHANICAL IDENTIFICATION

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Nameplates.
B. Tags.
C. Pipe Markers.
D. Ceiling grid.

### 1.2 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems.

### 1.3 SUBMITTALS

A. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
B. Submit a complete list of the naming conventions that will be utilized for each item requiring identification.
C. Product Data: Provide manufacturers catalog literature for each product required.

### 1.4 CONTRACT CLOSEOUT SUBMITTALS

A. Submit valve chart and schedule, including valve tag number, actual location, function, size and manufacturer's name and model number.
B. Submit chart indicating color coding for mechanical identification.

## PART 2 PRODUCTS

### 2.1 NAMEPLATES

A. Manufacturers:
   1. W.H. Brady.
   2. Seton Name Plate Company.
   3. Approved equal.
B. Description:
   1. 1/8" thick plastic with engraved letters on contrasting background color, beveled edges, screw mounting. Provide adhesive mounting where it is not feasible to attach plate with screws.
   2. Major Equipment Lettering Height: 3" high.
   3. Minor Equipment Lettering Height: 1-1/2” high.
C. Lettering Color: White.
D. Background Color: Red.

### 2.2 TAGS

A. Manufacturers:
   1. W.H. Brady.
   2. Seton Name Plate Company.
   3. Approved equal.
B. Plastic Tags:
   1. 1/16" thick laminate plastic with engraved letters on contrasting background color.

2. Color to match color used for pipe markers.
3. Tag size minimum 1-1/2 inch diameter.

C. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

D. Chart:
1. Typewritten letter size list in anodized aluminum frame.
2. Tabulate the following:
   a. Valve number.
   b. Piping system.
   c. System abbreviation, as shown on valve tag.
   d. Valve location, indicate room number and room name.
   e. Normal operating position (open, closed, or modulating).
3. Mark valves used for emergency shut-off or similar uses.
4. Include valve schedule in O&M Manuals.

## 2.3 DUCT AND PIPE MARKERS

A. Manufacturers:
1. W.H. Brady.
2. Seton Nameplate Company.
3. Approved equal.

B. Tape Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings; secure with 2" wide tape with arrows indicating flow.

C. Lettering Size: Minimum 1-1/2” high.

D. Colors:
1. Piping:
   a. Refrigerant: Green Background with white lettering.
2. Ductwork:
   a. Supply Air: Blue background with white lettering.
   b. Return Air: White background with green lettering.
   c. Exhaust Air: Yellow background with black lettering.
   d. Confirm with Owner if identification is desired for exposed work in finished spaces.
3. Access Doors for Fire Dampers, Smoke Dampers, Combination Fire/Smoke Dampers, and Smoke Detectors: Red background with white lettering.

## 2.4 CEILING GRID LABELS

A. Labels for grid ceiling grid shall be installed on T-bar grid below terminal equipment.

B. Provide Black ½” High Letters on clear background tape maximum width of T-bar.

C. Indicate Device and Equipment Number on Label.

# PART 3 EXECUTION

## 3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

## 3.2 INSTALLATION

A. Nameplates:
1. Install with corrosive-resistant mechanical fasteners or adhesive.
2. Major equipment locations:
   a. Air handling units.
   b. Heat transfer equipment.

3. Minor equipment locations:
    a. Control panels.
    b. Control power supply enclosures.
    c. Major control components outside panels.
    d. Starters.
    e. Variable Frequency Drives.

B. Tags:
1. Install with brass chain and "S" hooks around valve stems.
2. Locations:
    a. Main and branch piping valves.
    b. Automatic control valves, sensors, transmitters, relays, etc. Key to control schematic.
    c. Piping 2 inch diameter and smaller.
    d. Shut-off, balancing and drain valves for terminal equipment do not have to be tagged but must be scheduled on valve chart.

C. Duct and Pipe Markers:
1. Install in accordance with manufacturer's instructions.
2. Locations:
    a. Concealed and exposed piping.
    b. Concealed and exposed ductwork.
3. Pipe Identification:
    a. Identify the following:
        1). Service.
        2). Flow direction.
    b. Install in clear view and align with axis of piping.
4. Duct Identification: Identify service, flow direction, and duct size.
5. Locate identification as follows:
    a. A maximum of 20 feet apart on straight runs including risers and drops.
    b. Adjacent to each valve and tee.
    c. At each side of penetration of structure or enclosure.
    d. At each obstruction.

D. Access Doors for Fire Dampers, Smoke Dampers, Combination Fire/Smoke Dampers, and Smoke Detectors: Identify the device and its location within.

## 3.3 CEILING GRID LABELS

A. Grid Labels to indicate locations of the following systems above the ceiling shall include:
1. Reheat coils.
2. Control devices and sensors.
3. Temperature Control Panels.
4. Valves.
5. Manual volume dampers serving critical environments.
6. Motor operated dampers.
7. Fire, smoke and fire/smoke dampers.
8. And any additional HVAC systems directed by the owner.

## 3.4 EXISTING IDENTIFICATION SYSTEM

A. Existing Facility Nomenclature:
1. Utilize the facility’s existing naming conventions.
2. All new equipment provided as part of this project shall be the next in the series of that equipment type and shall not start at number one unless directed by the Owner.

B. Example facilities master color identification:
   1. Refrigerant systems – Blue.
   2. Natural Gas systems - Yellow
   3. Heating systems - Maroon.
   4. Associated Fire Protection systems – Red.

END OF SECTION

# SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING

## PART 1GENERAL

### 1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.
B. Measurement of final operating condition of HVAC systems.

### 1.2 REFERENCES

A. AABC - National Standards for Total System Balance.
B. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
C. SPS 364 - Heating, Ventilating and Air Conditioning, Department of Safety and Professional Services, Commercial Building Code.

### 1.3 SUBMITTALS

A. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
B. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side.
C. Contractor shall submit the final testing and balancing report prior to project completion and in advance of date of occupancy.
D. The final testing and balancing report shall comply with SPS 364.0313.
E. It shall be the Contractor's responsibility to monitor the progress of the work and coordinate the occupancy date with the Architect, to ensure the timely submission of the final TAB report.

### 1.4 CONTRACT CLOSEOUT SUBMITTALS

A. Submit reports on AABC National Standards for Total System Balance or NEBB forms.
B. Forms shall include the following information:
   1. Title Page:
      a. Company name, address, telephone & fax numbers.
      b. Project name & location.
      c. Project Architect, Engineer & Contractor.
   2. Air Handling Equipment:
      a. Location, area served, and drawing identification number.
      b. Manufacturer and model.
      c. Serial number.
      d. Air flow specified and actual.
      e. Return air flow, specified and actual.
      f. Outside air flow, specified and actual.
      g. Minimum design air flow(s), specified and actual.
      h. Maximum design air flow(s), specified and actual.
      i. Outside air temperature.
      j. Return air temperature.
      k. Mixed air temperature.
      l. Total static pressure (total external), specified and actual.
      m. Inlet static pressure.
      n. Discharge static pressure.
      o. Fan RPM specified and actual.

3. Fan Equipment Data:
    a. Location, area served and drawing identification number.
    b. Manufacturer and model.
    c. Serial number.
    d. Arrangement and class.
    e. Air flow specified and actual.
    f. Total static pressure (total external), specified and actual.
    g. Inlet static pressure.
    h. Discharge static pressure.
    i. Fan RPM specified and actual.
4. Electric Motor:
    a. Manufacturer.
    b. HP/BHP.
    c. Phase, voltage, amperage; nameplate, actual.
    d. RPM.
    e. Service factor and frame number.
    f. Starter size, rating, heater elements.
5. V-Belt Drive:
    a. Identification/location.
    b. Fan sheave, diameter, bore and make.
    c. Belt, size and quantity.
    d. Motor sheave, diameter, bore and make.
    e. Motor sheave center line distance.
    f. Motor sheave operator diameter.
6. Duct Traverse:
    a. System zone/branch.
    b. Duct size.
    c. Area.
    d. Design Velocity and air flow specified and actual.
    e. Duct static pressure.
7. Air Distribution Test Sheet:
    a. Air terminal number.
    b. Room number/location.
    c. Terminal type and size.
    d. Area factor.
    e. Design Velocity and air flow specified and actual.
    f. Percent of design air flow.
8. Cooling Coil Data:
    a. Identification number.
    b. Location.
    c. Service.
    d. Manufacturer.
    e. Coil type.
    f. Air flow, design and actual.
    g. Air pressure drop, design and actual.
    h. Water flow, design and actual.
    i. Water pressure drop, design and actual.
9. Heating Coil Data:
    a. Identification number.
    b. Location.
    c. Service.
    d. Manufacturer.
    e. Coil type.
    f. Air flow, design and actual.
    g. Air pressure drop, design and actual.
10. Provide basic System Diagrams/Schematics for:
    a. All air handling systems with Static Pressure (SP) profile.

## 1.5 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

## 1.6 QUALIFICATIONS

A. Agency and Experience:
   1. The Testing, Adjusting and Balancing (TAB) Contractor shall be a company specializing in the testing, adjusting, and balancing of systems specified in this Section.
   2. The TAB Contractor:
      a. Shall have a minimum of three (3) years of experience.
      b. Shall be independent and not be associated with the suppliers of equipment or the installing Contractor.

B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.

# PART 2PRODUCTS

Not used.

# PART 3EXECUTION

## 3.1 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Check for proper belt tension and alignment on the fan drives.
   2. Check that all motors and fan bearings have been lubricated.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fire, smoke and volume dampers are in place and open.
   7. Air coil fins are cleaned and combed.
   8. Access doors are closed, and duct end caps are in place.
   9. Air outlets are installed and connected.
   10. Duct system leakage has been minimized.
   11. Fans are rotating correctly.
   12. Systems are started and operating in a safe and normal condition.
   13. Temperature control systems including all auto dampers are installed complete and able to maintain stable fan operation.
   14. Service and balance valves are open.

B. Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

## 3.2 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

## 3.3 INSTALLATION TOLERANCES

A. Air Handling systems adjust to within of design:
   1. Supply air: Plus, or minus 5% percent.
   2. Return and Exhaust air: Plus, or minus 10% percent.
B. Air Outlets and Inlets adjust to within of design to space:
   1. Total air flow to space plus 10% percent and minus 5% percent.
   2. Outlets and inlets in space plus or minus 10% percent.

## 3.4 ADJUSTING

A. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
B. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
C. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
D. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

## 3.5 AIR SYSTEM BALANCE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
B. Make air quantity measurements in ducts by pitot tube traverse of entire cross-sectional area of duct.
C. Measure air quantities at air inlets and outlets.
D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
E. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers.
F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes as specified hereinafter. Vary branch air quantities by damper regulation.
G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for loading of filters.
H. Adjust outside air, return air, and exhaust air automatic dampers for design conditions.
I. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
J. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating, at a minimum OA quantity. Also record CFM and SP at maximum air flow, 100% outside air.
K. Measure building static pressure and adjust supply, return, and exhaust air systems to provide the following relationship between each to maintain approximately the static pressure indicated.

| Application | SP |
|---|---|
| General Building Pressure | +0.05 |

L. For variable air volume system terminals set to maximum and minimum air flow settings indicated and record.
M. Remove and replace belt guards as required in order to perform TAB work.
N. Plug test holes with plastic or rubber removable plugs.
O. Assist the Temperature Control Contractor in setting the duct static pressure control point for VAV system controls.

## 3.6 FANS WITH FIXED MOTOR SHEAVES

A. All fan equipment, which is indicated to be provided with a fixed V-belt drive in lieu of adjustable, shall require the following additional work by the TAB Contractor:
   1. Test the fan equipment and record the data.
   2. If the initial fixed motor sheave and belt set requires no adjustment, notify the Mechanical Contractor of this in writing, with a copy to the Engineer.
   3. If the design conditions are not obtained, calculate the final fixed motor sheave and/or belts required to obtain design conditions and notify the Mechanical Contractor in writing, with a copy to the Engineer. Specifically, by manufacturer, model and size, select and document the new equipment required.
   4. The Mechanical Contractor shall obtain the final fixed motor sheave and belt(s) from the fan manufacturer and turn them over to the TAB Contractor at the fan location.
   5. Remove the existing V-belt drive guard, remove the initial sheave/belts to be replaced, install the new drive equipment, retest the fan, and reinstall the drive guard.
   6. If the fan does not meet the design conditions due to the incorrect selection of the replacement drive equipment, the TAB Contractor shall provide additional drive modifications at no additional cost to the Owner.

## 3.7 INOPERABLE EQUIPMENT/SYSTEMS

A. If any is inoperable at time of testing, TAB Contractor shall return to the site and test such systems when they become operable and submit the associated data at that time, as an amendment to the primary report.

## 3.8 EXISTING EQUIPMENT/SYSTEMS

A. Air distribution systems:
   1. Balance, to new conditions, existing equipment, (AHU's, fans, etc.) to new conditions as indicated on the drawings.
   2. Balance, to new conditions, all existing supply, return, exhaust and transfer grilles/diffusers to the new conditions indicated.
   3. If existing grilles/diffusers are shown, but no air quantities are indicated, rebalancing is not required.
   4. If existing equipment is shown, but no air quantities are indicated, rebalancing is not required. Existing operating conditions shall be maintained.
   5. The following Air Handling Unit air systems shall be rebalanced:
      a. AHU-1
      b. AHU-2
      c. RTU-3
      d. RTU-4
      e. As indicated on drawings.

B. Areas outside the construction limits:
   1. Shall maintain the existing operating conditions.
   2. If existing equipment is shown, but no air/fluid quantities are indicated, existing operation conditions shall be confirmed prior to work beginning and maintained when work is completed.

## 3.9 PRE-CONSTRUCTION SYSTEM TESTING

A. The following existing HVAC systems shall be tested:
   a. AHU-1
   b. AHU-2
   c. RTU-3
   d. RTU-4

B. Systems shall be tested prior to the start of construction to establish the current existing operation conditions.
C. Operation conditions shall be documented in pretest report and submitted to engineer.
D. These conditions will be utilized to maintain air flow during construction, temporary, and final balance of the system to meet the existing operating conditions.
E. Refer to the project design drawings for further scope, equipment design schedules, locations, and testing points.
F. System components shall be tested include:
    1. AHU system CFM and static pressure profile.
    2. Air distribution duct mains:
        a. Supply air duct main(s) at discharge from AHU.
        b. Supply air shafts were indicated on plans.
        c. Return air duct main(s) at inlet to AHU.
        d. Return shafts were indicated on plans.

## 3.10 CONSTRUCTION PHASING

A. Systems shall be balanced to meet project construction phasing.
B. Provide testing and balancing of the temporary or permanent systems to maintain occupancy requirements during construction.
C. Provide at the completion of each phase a testing and balancing report.
D. At the completion of the project provide a final balance and report of all the systems and phases.
E. Coordinate project phasing with construction manager.
F. Coordinate HVAC systems balance to meet construction zones:
    1. Negative air pressure to adjacent spaces.
    2. Appropriately temporary supply air shall be provided to maintain construction zone make-up air and coordinated operations to minimize negative building air pressurization impacts.
    3. Temporary transfer air paths shall be provided.
    4. Temporary exhaust or filtered recirculation fans.
    5. All return air paths from within the construction zone shall be sheet metal capped.

## 3.11 SPS 364.0313 REQUIREMENTS

A. Balancing Contractor shall document in writing the amount of outdoor air being provided and distributed for the building occupants and any other specialty ventilation. Turn this document over to the owner so it can be retained at the site.
B. Air system balancing, so as to minimize throttling losses, shall be accomplished per Paragraph SPS 364.0313 requirements.

END OF SECTION

# SECTION 23 05 95 - HVAC SYSTEM CLEANING

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Equipment/Products.
B. HVAC Air Handling Unit and Fan Cleaning.
C. Ductwork Cleaning.

### 1.2 REFERENCES

A. NADCA 1992-01 - Mechanical Cleaning of Non-porous Air Conveyance System Components.

### 1.3 SUBMITTALS

A. List of primary equipment, accessories, and methods to be used to clean specific HVAC system components.
B. List of all chemical surface treatment products to be used, including material safety data sheets (MSDS).

### 1.4 CONTRACT CLOSEOUT SUBMITTAL

A. Report outlining the date completed, method used, and results obtained in the cleaning of all components.
B. Report shall include any observations of HVAC equipment problems noted while performing the cleaning work.

### 1.5 QUALITY ASSURANCE

A. Work under this Section shall be performed by a System Cleaning Contractor who is regularly engaged in the business of system cleaning and be a certified member of NADCA (National Air Duct Cleaners Association), utilizing equipment equivalent to that listed within this specification and shall have qualified workmen to perform work of the type required by these specifications.
B. Work shall be performed per NADCA 1992-01 and as hereinafter specified. NADCA Publication 1992-01 shall be a part of these specifications.

### 1.6 DESCRIPTION OF WORK

A. Work to be performed under this Section shall consist of supplying all equipment, accessories, material, and labor to complete the system cleaning, by source removal methods, of the heating, ventilating and air conditioning systems as shown on the drawings and described in the specifications.

## PART 2 EQUIPMENT/PRODUCTS

A. Equipment shall include but not be limited to the following primary items:
   1. Portable source removal unit capable of producing 4500 CFM through a three (3) filter filtration unit consisting of 100 sq. ft. of pre-filter surface area, electrostatic secondary filtration section, 99.97% efficient HEPA final filter.
   2. Totally enclosed portable air compressor capable of operating at 190 psi.
   3. Portable pressure washer with operating ranges from 500 psi at 0.7 gpm to 1000 psi at 1.7 gpm.

B. Products: All anti-microbial materials shall be EPA registered specified for use in HVAC systems.

## PART 3 EXECUTION

### 3.1 CONTINUITY OF SERVICE

A. Contractor shall not interrupt existing services except at such times and for such periods of time as is acceptable to the Owner.

### 3.2 CODES AND PERMITS

A. This Contractor shall obtain and pay for all permits or licenses required under this contract.

### 3.3 DEBRIS REMOVAL

A. Contractor shall remove from the job site all debris removed from the HVAC systems. Debris is not to be deposited in the Owner's trash systems.

### 3.4 HVAC AIR HANDLING UNIT AND FAN CLEANING

A. Vacuum the unit interior using a HEPA filtered dry vacuum unit.
B. All internal electrical equipment and fan bearings to be protected with polyurethane during cleaning.
C. Coils and fans to be chemically treated and pressure washed.
D. All excess liquids to be collected with a HEPA filtered wet vacuum unit.
E. After all surfaces have been cleaned, a visual inspection may be performed by the Owner or Owner's representative.
F. Following is a list of units which shall be cleaned:
   1. AHU-1
   2. AHU-2
   3. RTU-3
   4. RTU-4

### 3.5 DUCTWORK CLEANING

A. All source removal vacuum units shall be 99.97% HEPA filtered for containment of removed particulate.
B. Protect Owner's equipment and merchandise with polyurethane or drop cloths during the cleaning process.
C. At pre-selected locations in the system, install the source removal system and air wash sections or ductwork to remove all visible contaminants.
D. All registers, grilles and diffusers shall be removed, washed, and reinstalled.
E. Install critical barriers in the system as required to protect cleaned areas from areas to be cleaned.
F. Any exterior insulated ductwork requiring access shall be neatly cut. After cleaning is complete, patch ductwork and replace insulation to restore to the original condition.
G. All openings made in the system shall be patched with same gauge metal as existing ductwork, screwed into place and sealed with a silicone sealer. Any 1" holes or smaller shall be plugged with airtight cap plugs.
H. Cover all supply diffusers with a special filter material prior to start-up of equipment to protect surroundings. Filter material may be removed after eight (8) hours of operation.
I. Provide the Owner or Owner's representative with suitable access points and the use of a fiber optics borescope, so an inspection of the cleaned surfaces can be made.

J. Following ductwork systems shall be cleaned as part of this contract:
   1. AHU-1 and 2, RTU-3 and 4:
      a. Supply air.
      b. Return air.
   2. KH-1 grease duct exhaust.

## 3.6 CLEANLINESS VERIFICATION

A. Contractor shall verify system cleanliness and specification compliance per NADCA 1992-01 by visual inspection and review by Owner.
B. This Contractor shall include the testing of coil air flow versus pressure drop pre-construction and post construction to verify coil cleaning performance.

END OF SECTION

# SECTION 23 07 13 - INSULATION

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Ductwork insulation.
B. Piping insulation.
C. Insulation jackets.

### 1.2 REFERENCES

| | | |
|---|---|---|
| A. | ASTM C165 - | Compressive Properties of Thermal Insulation. |
| B. | ASTM C177 - | Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of Guarded Hot Plate Apparatus. |
| C. | ASTM C195 - | Mineral Fiber Thermal Insulating Cement. |
| D. | ASTM C209 - | Cellulosic Fiber Insulating Board. |
| E. | ASTM C272 - | Water Absorption of Core Materials for Structural Sandwich Construction. |
| F. | ASTM C335 - | Steady-State Heat Transfer Properties of Horizontal Pipe Insulation. |
| G. | ASTM C411 - | Hot Surface Performance of High Temperature Thermal Insulation. |
| H. | ASTM C449 - | Mineral Fiber Thermal Insulating and Finishing Cement. |
| I. | ASTM C518 - | Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus. |
| J. | ASTM C533 - | Calcium Silicate Block and Pipe Thermal Insulation. |
| K. | ASTM C534 - | Preformed Flexible Elastomeric Cellular Thermal Insulation. |
| L. | ASTM C547 - | Mineral Fiber Preformed Pipe Insulation. |
| M. | ASTM C553 - | Mineral Fiber Block and Board Thermal Insulation. |
| N. | ASTM C591 - | Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation. |
| O. | ASTM C612 - | Mineral Fiber Block and Board Thermal Insulation. |
| P. | ASTM C680 - | Estimate of Heat Gain or Loss. |
| Q. | ASTM C1104 - | Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation. |
| R. | ASTM D1056 - | Flexible Cellular Materials. |
| S. | ASTM E96 - | Water Vapor Transmission of Materials. |
| T. | UL 723/ASTM E84 - | Surface Burning Characteristics of Building Materials. |
| U. | NFPA 90A - | Installation of Air Conditioning and Ventilating Systems. |
| V. | MICA - | National Commercial & Industrial Insulation Standards, Sixth Edition. |
| W. | ASTM B209 - | Aluminum and Aluminum-Alloy Sheet and Plate. |
| X. | ASHRAE 90.1 - | Energy Standard for Buildings. |

### 1.3 PERFORMANCE REQUIREMENTS

A. Insulation system shall meet the following UL-723 and ASTM E84 requirements:
   1. Maximum flame spread rating classifications: 25.
   2. Maximum smoke developed: 50.
B. Insulation systems shall meet ASHRAE 90.1 requirements.

## 1.4 QUALITY ASSURANCE

A. Insulation systems shall be applied by experienced contractors.
B. Within the past five (5) years, the contractor shall be able to document the successful completion of a minimum of three (3) projects of at least 50% of the size and similar scope of the work specified in this section.

## 1.5 SUBMITTALS

A. Product Data: Provide product description, list of materials and thickness for each service.
B. Manufacturer's Installation Instructions: Indicate procedures which ensure acceptable workmanship and installation standards will be achieved.
C. Submit shield and insert schedule.
D. Submit MICA plates with product descriptions for each insulation and piping system.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Store insulation in original wrapping and protect from weather and construction traffic.
B. Protect insulation against dirt, water, chemical, and mechanical damage.
C. Protect productes from exposure to UV light from the sun.

## 1.7 DEFINITIONS

A. Thermal Conductivity (K value): Units of Btu-inch/hour per square foot per °F.
B. ASJ+: All Service Jacket composed of aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film layer leaving no paper exposed.
C. Abbreviations:
   1. ASJ: All Service Jacket (no outer film).
   2. FSK: Foil Scrim Kraft; jacketing.
   3. PSK: Poly Scrim Kraft; jacketing.
   4. PVC: PolyVinyl Chloride.
   5. PMJ: Protective Metal Jacket.
   6. SAJ: Laminated/Self-Adhering Jacket.
   7. VRJ: Vapor Retarding Jackets.
D. Polybrominated diphenyl ethers (PBDE) such as Penta-BDE, Octa-BDE or Deca-BDE fire retardants: Have been linked to adverse health effects after exposure in low concentrations.

# PART 2 PRODUCTS

## 2.1 GENERAL

A. 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.
B. Pipe insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke developed rating not higher than 450 when tested in accordance with UL 723 and ASTM E84.
C. Insulation types shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.

## 2.2 FIBERGLASS (F.G.) INSULATION

A. Manufacturers:
   1. Certainteed.
   2. Johns Manville.

3. Knauf.
4. Owens Corning (O.C.) Fiberglass Corporation.

B. Material:
1. ASTM C547, ASTM C553 and ASTM C612 flexible, semi-rigid and rigid glass fiber insulation.

C. Flexible:
1. Maximum Service Temperature: ASTM C411, 250°F.
2. Maximum Moisture Adsorption: ASTM C1104, less than 3.0% by weight.
3. 'K' Value: ASTM C177, 0.30 at 75°F mean temperature.
4. Minimum Nominal Density: 0.75 lb. /ft$^3$.
5. Vapor Barrier Covering:
   a. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film (FSK).
   b. Moisture vapor transmission: ASTM E96; 0.02 perm.
   c. Pressure sensitive tape to match the covering.

D. Semi-Rigid:
1. Maximum Service Temperature: ASTM C411, 450°F.
2. Maximum Moisture Absorption: ASTM C1104, less than 5% by weight.
3. 'K' Value: ASTM C177, 0.27 at 100°F mean temperature.
4. Compressive Strength at 10% Deformation: ASTM C165, minimum 125 lb. /ft$^2$.
5. Minimum Nominal Density: 3 lb. /ft$^3$.
6. Vapor Barrier Covering:
   a. All service jacket conforming to ASTM C1136 Type I or FSK conforming to ASTM C1136 Type II.
   b. Moisture vapor transmission: ASTM E96, 0.02 perm.
   c. Pressure sensitive tape to match the covering.

E. Rigid:
1. Piping:
   a. Maximum Service Temperature: ASTM C411, 850°F.
   b. Maximum Moisture Adsorption: ASTM C553, 0.20 percent by volume.
   c. 'K' Value: ASTM C335, 0.24 at 125°F.
   d. Minimum Nominal Density: 0.75 lb. /ft$^3$.
   e. Longitudinal Joint: Double pressure sensitive adhesive self-sealing lap system.
   f. Vapor Barrier Covering:
      1). All service jacket.
      2). Moisture vapor transmission: ASTM E96, 0.02 perm.
      3). Pressure sensitive tape to match the covering for butt joints.
   g. Fittings:
      1). Covers:
         a). Material: High impact PVC.
         b). Minimum Thickness: 0.006".
         c). Color: White.
         d). Vapor and moisture resistant.
      2). Insulation:
         a). Precut fiberglass inserts.
         b). 'K' value: ASTM C177, 0.26 at 75°F.
2. Ductwork and Equipment:
   a. Maximum Service Temperature: ASTM C411, 450°F.
   b. Maximum Moisture Absorption: ASTM C1104, less than 5% by weight.
   c. 'K' Value: ASTM C177, 0.23 at 75°F.
   d. Minimum Nominal Density:
      1). Ductwork:
         a). Indoor: 3.0 lb. /ft$^3$.
         b). Outdoor: 6.0 lb. /ft$^3$.
      2). Equipment: 6.0 lb. /ft$^3$.

e. Vapor Barrier Covering:
   1). Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
   2). Moisture vapor transmission: ASTM E96, 0.02 perm.
   3). Pressure sensitive tape to match the covering.

## 2.3 ELASTOMERIC INSULATION

A. Manufacturers:
   1. Aeroflex.
   2. Armacell.
   3. K-Flex.
B. Type: Flexible closed cell.
C. Material: ASTM C534, elastomeric insulation.
D. 'K' Value: ASTM C177 or ASTM C518, 0.27 at 75°F.
E. Minimum Nominal Density: ASTM D1622, 5.5 lb. /ft$^3$.
F. Service Temperatures: -20°F to 220°F.
G. Maximum Water Vapor Permeability: ASTM E-96, 0.08 perm.
H. Maximum Moisture Absorption: ASTM C209, 0.2% by volume.
I. Minimum Compressive Strength: 4.5 psi at 25% deformation.
J. Adhesive: Synthetic rubber base with synthetic resins and fillers, compatible with insulation equal to Armacell 520 adhesive.

## 2.4 POLYOLEFIN INSULATION

A. Type: Flexible closed cell.
B. 'K' Value: ASTM C177 or ASTM C518, 0.24 at 75°F.
C. Minimum Nominal Density: ASTM D1622, 1.5 lb. /ft$^3$.
D. Service Temperatures: -165°F to 210°F.
E. Minimum Compressive Strength: 5 psi at 25% deformation.
F. Maximum Water Vapor Permeability: ASTM E-96, 0.0 perm.
G. Maximum Moisture Absorption: ASTM C209, 0% by weight and volume.

## 2.5 POLYISOCYANURATE INSULATION

A. Manufacturers:
   1. Dow Chemical, Trymer.
   2. Approved equal.
B. Material: ASTM C591, rigid cellular polyisocyanurate insulation.
C. 'K' Value: ASTM C518, 0.19 at 75°F.
D. Minimum Nominal Density: ASTM D1622, 2.0 lb. /ft$^3$.
E. Minimum compressive strength of 24 psi parallel and 13 psi perpendicular.
F. Maximum Service Temperature: 300°F.
G. Maximum Water Vapor Permeability: ASTM E-96, 4 perm.
H. Maximum Moisture Absorption: ASTM C272, 0.15% by volume.
I. Vapor Retarder:
   1. Saran 540 vapor retarder film.
   2. Maximum water vapor permeability: ASTM E-96, 0.02 perm.
   3. Thickness: 4 mils.
   4. Color: White.
J. Fittings:
   1. Insulation: Pre-cut inserts of same type and thickness as adjacent pipe insulation.
   2. Vapor retarder:
      a. Saran vapor retarder tape.
      b. Maximum Water Vapor Permeability: ASTM E-96, 0.03 perm.
      c. Thickness: 2 mils.
      d. Color: White.

## 2.6 CALCIUM SILICATE INSULATION

A. Manufacturers:
   1. Owens-Corning.
   2. Pabco
   3. Schuller.
B. Material: ASTM C533, rigid hydrous calcium silicate pipe and block insulation, asbestos free.
C. 'K' Value: ASTM C177 and C518, 0.50 at 500°F.
D. Maximum Service Temperature: 1200°F.
E. Compressive Strength at 5% Deformation: ASTM C165, minimum 140 psi.
F. Minimum Nominal Density: 13 lb. /$ft^3$.
G. Tie Wire: 16 gauge galvanized steel with twisted ends on maximum 12 inch centers.
H. Bands: 1/2" X 0.015 galvanized bands on 12 inch centers.
I. Pre-formed pipe insulation for piping up to 24 inch diameter, segmented and scored block for larger pipe and vessel sizes.

## 2.7 MINERAL WOOL INSULATION

A. Manufacturers:
   1. Johns Manville (previously IIG – Industrial Insulation Group).
   2. Rockwool (previously Roxul).
   3. SPI – Specialty Products & Insulation Co.
B. Minimum Nominal Density: 8 lb./$ft^3$.
C. Pre-formed in (2) two half cylinder sections. Cut V-groove pipe insulation is not acceptable.
D. 'K' Value: 0.29 at 200°F.
E. Minimum Compressive Strength: 5 PSI.
F. Maximum Wicking: 1%.
G. Maximum Water Adsorption: 1% by volume.
H. Service Rating: -120°F to 1200°F.

## 2.8 ADHESIVES, MASTIC, SEALANTS, AND REINFORCING MATERIALS

A. Products shall be compatible with surfaces and materials on which they are applied and shall be suitable for use at opening temperatures of systems to which they are applied.
B. Fiberglass Insulation Adhesive: Must comply with ASTM C916, Type II: Foster 85-60, Childers CP-127, Duro Dyne SSG.
C. Vapor Retarding Mastic:
   1. Below ambient equipment/piping insulation, mastic vapor permenance shall be less than 0.03 perms at 45 mils dry film thickness per ASTM 96: Foster 30-65 Vapor Fas, Childers CP-34, Vimasco 749.
   2. Below ambient equipment/piping, mastic must be anti-fungal and shall meet ASTM D 5590 with 0 growth rating (AF), water vapor permeance shall be less than 0.013 perms at 43 mils dry film thickness per ASTM E 96 Procedure B: Foster 30-80AF Vapor Safe Mastic or equal.
D. Weather Barrier Breather Mastic: Above ambient equipment/piping. Permeance shall be greater than 1.0 perms at 1/16” dry film thickness per ASTM E96. Foster 46-50 Weatherite, Childers Vi-Cryl CP-10/CP-11, Vimasco WC-5.
E. Lagging Adhesive/Coatings:
   1. Indoors application used in conjunction with canvas/glass cloth: Foster 30-36, Childers CP-50 AMVI, Vimasco 713.
   2. For all indoor applications, coating must be anit-fungal and shall meet ASTM D5590 with 0 growth rating (AF): Foster 30-36 AF Seal Fas, Childers CP-137 AF Chil-Seal.
F. Reinforced Mesh: Foster 42-24 Mast A Fab, Childers Chil Glas #10 or Pittsburg Corning PC 79.

G. Metal Jacketing Sealant for All Aluminum Jacketing: Foster 95-44 Elastolar, Childers CP-76 Chil-Byl, Pittsburg Corning 727.
H. Insulation Joint Sealant (polyisocyanurate) – used on all below ambient piping: Foster 95-50 Elextra, Childers CP-76 Chil-Byl, Pittsburg Corning CW Sealant.

## 2.11 JACKETS

A. Canvas (FMJ):
   1. Fabric: 9 oz. /yd$^2$, plain weave cotton treated with dilute fire retardant lagging adhesive.
   2. Lagging Adhesive and Finish Coat:
      a. Manufacturers:
         1). Chicago Mastic.
         2). Childers.
         3). Foster.
      b. Compatible with insulation.
   3. Outdoor application: Adhesive shall be a weather barrier mastic.
B. All Service Jacket (ASJ):
   1. Fabric: Heavy duty 9 oz./yd$^2$, fire retardant material with kraft reinforced foil vapor retarding jacket, factory applied to insulation with self-sealing pressure sensitive adhesive lap.
   2. Maximum permanence: 0.02” perms.
   3. Minimum Beach Puncture Resistance: 50 units.
   4. Outdoor Application: Adhesive shall be a weather barrier mastic.
C. PVC (PFJ):
   1. Manufacturers:
      a. Proto.
      b. Johns Manville.
   2. Material: White PVC flim, glass finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU.
   3. Minimum thickness:
      a. 12” and smaller 0.02" (indoor)/0.03” (outdoor).
      b. 14” and larger 0.03” (indoor)/0.04” (outdoor).
   4. Color: High gloss white.
   5. For outdoor applications utilize ultraviolet inhibited products.
D. Laminated Self Adhearing Jacket (SAJ):
   1. Manufacturers:
      a. Venture Tape.
      b. Knauf, Redi-Klad 1000 (embossed aluminum).
      c. Ideal Tape Co.
   2. Material: Self-adhering membrane consisting of laminated reflective high density aluminum foil, high density waterproof polymer films.
   3. Adhesive:
      a. Acrylic adhesive with release paper.
      b. Application range -10°F to 248°F.
      c. Minimum Adhesive Thickness: 2 mils.
   4. Interior Applications – Venture Clad 1577CW-CM.
      a. Minimum Material Thickness: 8.0 mils.
      b. Flame Spread/Smoke Developed: 25/30.
      c. Water Permeability: 0.0000 perm.
      d. Maximum Elongation: 80%.
   5. Exterior Applications – Venture Clad 1579CW-WE (white embossed):
      a. Minimum Material Thickness: 15.5 mils.
      b. Flame Spread/Smoke Developed: 25/20.
      c. Water Permeability: 0.0000 perm.
      d. Puncture Resistance: 80 lbs.
      e. Maximum Elongation: 35%.

6. Service temperature:
    a. Rated for continuous operating temperatures of -20°F to 150°F.
7. Vapor Retarding tapes:
    a. Vapor retarding tape shall be specifically designed and manufacturered for use with the self-adhering jacket specified above. Provide tape by the same manufacturerer that provides jacketing.
    b. Vapor retarding tape maximum permeance: 0.0 perms.

E. Protective Metal Jacket (PMJ):
1. Material:
    a. Aluminum: ASTM B209.
    b. Stainless Steel: Type 304.
2. Thickness:
    a. 0.016 inch aluminum or 0.010 inch thick stainless steel with safety edge for indoor installations.
    b. 0.024 inch thick aluminum or 0.016 in thick stainless steel with safety edge for outdoor installations.
3. Finish:
    a. Aluminum: Smooth.
    b. Stainless Steel: 2B.
4. Joining: Longitudinal slip joints and 3 inch laps. (Lap at 4 o'clock position facing down).
5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
6. Metal Jacket Bands: 3/4 inch wide, 0.015” thick aluminum or 0.010” thick stainless steel, on 12" centers (or pop rivets on 4" centers).

F. Closed Cell:
1. Two coats of manufacturers weatherproof finish.
2. Glass mesh adhered to insulation with commercially available mastic. WB/Armaflex or equivalent.

G. Vapor Retarding Jacket (VRJ):
1. Polyvinylidene chloride (PVDC) vapor retarding jacket material.
2. Manufacturers: Dow Saran or equivalent.
3. Minimum Material Thickness: 6 mils.
4. Maximum Permeance: 0.01 perms.
5. Material shall not support the growth of mold or mildew.
6. Vapor Retarding tapes:
    a. Vapor retarding tape shall be specifically designed and manufactured for use with the self-adhering jacket specified above. Provide tape by the same manufacturer that provides jacketing.
    b. Vapor retarding tape maximum permeance: 0.01 perms.

H. Foil Scrim Jacket (FSJ) all service:
1. Glass fiber reinforced foil kraft laminate, factory applied to insulation.
2. Maximum permeance of 0.02 perms.
3. Minimum beach puncture resistance of 25 units.

## 2.12 INSULATION INSERTS AND PIPE SHIELDS

A. Manufacturers:
1. B-Line.
2. Pipe Shields
3. Value Engineered Products

B. Provide inserts with calcium silicate or polyisocyanurate for service temperatures above ambient but below 300°F only.

C. Provide inserts with polyisocyanurate for below ambient service temperatures based on the information below:
1. For pipe sizes up to and including 4”: Trymer 2000XP.
2. For pipe sizes up to and including 12”: Trymer 3000.

3. For pipe sizes up to and including 18”: Trymer 4000.
4. For pipe sizes 20” and above: Trymer 6000.

D. Minimum Compressive Strength: 140 psi. Piping 12” and larger, supplement with high density 600 psi structural calcium silicate insert.
E. Provide galvanized steel shield as specified in section 23 05 29..
F. Insert and shield to provide 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.
G. 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.
H. Wood blocks will not be accepted.

## 2.13 ACCESSORIES

A. Tack fastners to be stainless steel ring grooved shank tacks.
B. Staples to be clinch style.
C. Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.
D. Finishing cemet to be ASTM C449.
E. Fibrous glass or canvas fabric reinforcing used with lagging adhesive shall have a minimum untreated weight of 6 oz./sq. yd.
F. Joints sealants and metal jacketing sealant to be non-shrinking and permanently flexible.
G. Vapor retarding coatings to have maximum applied water vapor permeance of 0.03 perms or less at 45 mils dry at tested by ASTM E96.
H. Fungicidal water base duct liner coating (Foster 40-20 or equal) to be compatible with vapor retarding coating. This product must be EPA registered to be used inside HVAC ducts. Coating must comply with ASTM D 5590 with 0 growth rating.

# PART 3 EXECUTION

## 3.1 EXAMINATION

A. Verify that piping and ductwork has been successfully tested before applying insulation materials.
B. Verify that surfaces are clean, foreign material removed, and dry.

## 3.2 GENERAL REQUIREMENTS

A. Install materials in accordance with manufacturer's instructions and MICA publication “Commercial and Industrial Standards, Most Recent Edition.”
B. Continue insulation without interruptions through walls, sleeves, and hangers.
C. Use full material as delivered from manufacturer wherever possible.
D. Maintain vapor barrier continuous through all penetrations.
E. Apply insulation carefully without voids or use of damaged sections; if leaks or other defects develop after covering, remove insulation and (after repair of leaks or defects) replace equal to original without additional cost to the Owner.
F. Repair all insulation on existing ductwork and piping (to the same thickness and material as the existing insulation) which is damaged due to connecting of new ductwork or piping. Maintain integrity of existing vapor barrier.
G. Provide a complete vapor retarding jacket for insulation on the following system:
1. Refrigerant
2. Insulated Duct
3. Equipment, ductwork or piping with a surface temperature below 65°F.

## 3.3 PROTECTIVE JACKET INSTALLATION

A. PVC Fitting Covers and Jackets (PFJ):
   1. Lap seams and joints a minimum of 2 inches and seal PVC with welding solvent recommended by jacket manufacturer.
   2. Lap slip joint ends 4" without fasteners where required to absorb expansion and contraction.
   3. For sections where vapor retarding jacket is not required and jacket requires routine removal, tack fasteners may be used.
   4. Secure PVC fitting covers with tack fasteners.
   5. For systems requiring a Vapor Retarding Jacket (VRJ), apply a 1-1/2” band of mastic over ends, throat, seams and penetrations.

B. All Service Jackets (ASJ) and Foil Scrim All Service Jackets (FSJ): Install according to manufacturer’s recommendations using factory supplied lap seals and butt strip seals.

C. Protective Metal Jacket (PMJ):
   1. Lap seams a minimum of 2 inches.
   2. Secure with metal bands for end to end joints, and rivets or sheet metal screws for longitudinal joints.
   3. Rivets, screws, and bands to be constructed of the same material as the jacket.
   4. Locate seams on bottom for exterior applications.
   5. Seal laps with 1/8” bead of metal jacketing sealant to prevent water entry.

D. Self-Adhering Jackets (SAJ) (Laminated Jacket):
   1. Install according to manufacturer’s recommendations.
   2. Clean and dry surfaces prior to application.
   3. Cut allowing minimum 4” overlap on ends and 6” on longitudinal joints.
   4. Align parallel to surface. Remove release paper and press flat to surface to avoid wrinkles.
   5. Remove release paper and rub entire surface for full adhesion and sealing at joint overlaps.
   6. Provide a bead of compatible caulk along exposed edges.
   7. Piping with self-adhering (SAJ) jackets shall have elbows, fittings, valves and butt joints wrapped with 2 layers of vapor retarding tape.
   8. Piping with a PVC jacket (PFJ) installed over the self-adhering (SAJ) jacket may be provided with a single, lapped layer of vapor retarding tape for elbows, fittings and valves under the PVC jacket.
   9. Vapor retarding tape shall be compatible with the jacket material used.

E. Vapor Retarding Jackets (VRJ):
   1. Piping shall have elbows, fittings, valves and butt joints wrapped with 2 layers of vapor retarding tape.
   2. Piping with a PVC jacket (PFJ) installed over the vapor retarding jackets (VRJ) may be provided with a single, lapped layer of vapor retarding tape for elbows, fittings and valves under the PVC jacket.
   3. Vapor retarding tape shall be compatible with the jacket material used.

## 3.4 PIPING, VALVE, AND FITTING INSULATION INSTALLATION

A. Install insulation with closed butt joints and longitudinal seams. Provide minimum 2” lap on jacket seams and 2” tape on butt joints with lap adhesive unless otherwise noted. Secure with staples along seams and butt joints.

B. On systems requiring a vapor retarding jacket, seal off all raw ends of insulation and butt joints with vapor retarding mastic at intervals of not more than 20 feet on piping. Coat staples, longitudinal and transverse seams with vapor retarding mastic and on systems requiring vapor retarding jacket, coat insulated elbows, fittings, and valves with vapor retarding mastic.

C. Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation. Where a vapor retarding jacket is not required or where roller hangers are not being used, 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 retarding jacket, extend insulation and vapor retarding jacketing/coating around riser clamp.

D. Where anchors or supports are secured directly to cold piping, extend insulation up the anchor or support for a distance of four (4) times the insulation thickness. Maintain vapor barrier where insulation is terminated.

E. Where insulated piping is installed on hangers and supports, the insulation shall be installed continuous through the hangers and supports. High density inserts shall be provided as required to prevent the weight of the piping from crushing the insulation. Pipe shields are required at all support locations. The insulation shall not be notched or cut to accommodate the supporting channels.

F. Fully insulate all reheat coil piping, fittings and valves (with the exception of unions) up to coil connection to prevent condensation when coil is inactive during cooling season. Provide a vapor proof seal between the pipe insulation and the insulated coil casing.

G. Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built up insulation of the same thickness as adjoining insulation.

H. Where the service temperature exceeds 150°F cover insulation with fabric reinforcing and mastic.

I. Where the service temperature does not exceed 150°F provide PVC fitting covers.

J. Insulation Inserts and Pipe Shields:
   1. Provide pipe shields at all hanger and support locations. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Quantity and placement of inserts shall be according to the manufacturer's installation instructions, however the inserts shall be no less than 12" in length. Inserts shall be of equal thickness to the adjacent insulation and shall be vapor sealed as required for system.
   2. 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.

K. Fiberglass Insulation:
   1. Seal edges, joints, seams, penetrations, and punctures with white mastic with a #20 glass fabric imbedded in the mastic, or tape to match the jacket.
   2. Butt joints: Firmly butted and sealed with a 3" wide, reinforced pressure sensitive tape to match insulation jacket.
   3. Semi-rigid insulation: Staple a minimum 2" lap on 3" centers with outward clinching staples. Cover staples with adhesive or tape to match the jacket.
   4. Rigid insulation:
      a. Piping: Position longitudinal lap downward.
      b. Valves, fittings and flanges:
         1). 14" and smaller:
            a). Covered with PVC fitting jackets.
            b). Insulate with pre-cut insulation inserts of the same type and thickness of insulation as that on the adjacent pipe.
            c). Apply vapor-barrier mastic on adjoining section of pipe insulation and on overlapping edges of jacket and throat seam before applying jacket cover.
            d). Tape joints between fitting cover and adjoining pipe insulation with pressure-sensitive vapor-barrier tape; allow a 2" end overlap on tape joint and with overlap facing down.
         2). 16" and larger: Cover with insulating cement same thickness as adjoining insulation.

L. Mineral Fiber:
   1. Install per manufacturer's recommendations.
   2. Secure each 3' section with three metal bands snip off excess and turn ends over into insulation to prevent exposed sharp edges.
   3. Stagger joints where more than one layer is used.

M. Elastomeric and Polyolefin:
   1. Where practical, slip insulation on piping during pipe installation when pipe ends are open.
   2. Miter cut fittings allowing sufficient length to prevent stretching.
   3. Seal seams and joints for vapor tight installation.
   4. For elastomeric insulation apply full bed of adhesive to both surfaces.
   5. For polyeolefin insulation seal factory pre-glued seams with roller and field seams & joints with full bed of hot melt polyolefin glue to both surfaces.
   6. Cover elastomeric insulation on systems operating below 40°F with vapor retarding mastic.
   7. Stagger joints of multiple layers to meet thickness requirements.

N. Extruded Polyisocyanurate:
   1. Fittings, valves, unions, flanges, couplings and specialties shall be insulated with factory molded insulation of the same thickness as adjoining insulation.
   2. Fill all voids in insulation with 2-part Dow Froth-Pak (aged R-value of 5.5, initial R-value of 6.0, and insulation density of 1.75 pcf) or equivalent, expanding polyisocyanurate foam insulation listed for use with polyisocyanurate insulation.
   3. Secure insulation sections with two wraps of nylon filament tape 9"-12" on center.
   4. Orient longitudinal joints between half-sections in the 3 o'clock and 9 o'clock position.
   5. Provide vapor retarder film and tape for pipe service temperatures below 60°F.
   6. Provide vapor retarder film and tape for pipe service temperatures above 60°F where a jacket is not required.
   7. For pipe service temperatures below 32°F cover joints with two layers of vapor retarder tape.
   8. Elbows, Valves and Fittings:
      a. Install pre-fabricated insulation inserts of same type and thickness of adjoining insulation.
      b. Wrap with saran vapor retarder tape in a spiral configuration.
      c. When factory applied vapor retarder film is used, seal joint with SSL tape. Apply vapor retarder tape around joint with minimum ¼ circumference overlap.
      d. For pipe service temperatures below 32°F, provide a minimum 50% overlap between successive courses of spiral wrapped tape.
   9. Cover insulation with a protective jacket as specified below.
   10. Apply full bead of silicone sealant as a vapor stop at all penetrations (thermometers, gauges, vent and drain lines, etc.) and between pipe and insulation on both sides of valves, expansion/contraction joints, flanges, etc.
   11. On single insulation layer systems and on the outer layer of double insulation layer systems, apply a thin coat of elastomeric joint sealant rated for system operating temperatures to all longitudinal and butt insulation joints covering entire face of joint. Allow sealant to fully cure before applying protective covering.
   12. For piping service below 0°F:
      a. Use two layers of insulation with inner and outer butt and longitudinal joints staggered and offset 90 degrees.
      b. Do not use sealant on the inner layer or adhere the inner layer to the outer layer.
      c. Insulate non-circulated lines, control lines, vents, etc. for a minimum distance of 6" from pipe.
      d. Do not penetrate protective covering or insulation with mechanical fasteners.

## 3.5 PIPING PROTECTIVE JACKETS

A. In addition to the jackets specified in the pipe insulation schedule below the following protective jackets are required:
B. Provide a protective PVC jacket (PFJ) for the following insulated piping:
   1. Exposed piping in kitchens
   2. Piping exposed in finished locations
C. Provide a protective PVC (PFJ) or Fabric Reinforced Mastic jacket (FMJ) for the following insulated piping:
   1. All piping within mechanical rooms.
D. Provide a protective metal jacket (PMJ) for the following insulated piping:
   1. Exterior refrigeration piping accessible from grade.

## 3.6 PIPE INSULATION SCHEDULE:

A. Provide insulation on new and existing remodeled piping as indicated in the following schedule:

| SERVICE | INSULATION | JACKET | INSULATION THICKNESS BY PIPE SIZE | |
|---|---|---|---|---|
| | | | < 2” | ≥ 2” |
| Cooling Coil Condensate Drain | Rigid Fiberglass | ASJ | 1.5” | 1.5” |
| Refrigerant Hot Gas Piping | Rigid Fiberglass | ASJ | 1.5” | 1.5” |
| Refrigerant Hot Gas Piping – Exterior Application | Rigid Fiberglass | SAJ | 1.5” | 1.5” |
| Refrigerant Suction | Closed Cell / Polyisocyanurate | SAJ | 1” | 1.5” |

B. The following piping and fittings are not to be insulated:
   1. Flexible connections.
C. For systems with fluid temperatures 65°F or less, furnish and install removable elastomeric insulation covers, plugs or caps for all mechanical equipment and devices that require access by balancing contractors or service and maintenance personnel. Examples include but are not limited to: flow sensing devices, drain valves, pressure/temperature test plugs, equipment labels, etc. Covers shall be tight fitting to ensure a complete vapor retarding barrier.
D. Outdoor piping above grade: Add 1" minimum of thickness to that listed, unless there is a specific description for outdoor applications.
E. For piping which carries hot and cold water, insulation type and thickness shall comply with hot water insulation requirements.
F. For piping with heat tracing cable, use insulation for one pipe size larger to allow space for installation of cable.
G. Insulate coil headers located outside air flow as specified for piping.
H. Insulate branch piping to coil header as specified for piping.

## 3.7 DUCTWORK INSTALLATION:

A. Insulate entire system including fittings, joints, flanges, and dampers.
B. Continue insulation without interruptions through walls, sleeves, and hangers.
C. Bevel and seal ends of insulation where service access is required.
D. Use full material as delivered from manufacturer wherever possible.
E. Maintain vapor barrier continuous through all penetrations.
F. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
G. Standing seams and hangers: Cover with minimum of 1/2" insulation.

H. Insulate up to walls and floors where fire dampers or combination fire/smoke dampers are located.
I. Insulate through smoke barriers with space between insulation and barrier sealed as specified in section 23 31 00.
J. Apply insulation carefully without voids or use of damaged sections; if leaks or other defects develop after covering, remove insulation and (after repair of leaks or defects) replace equal to original without additional cost to the Owner.
K. Secure flexible duct insulation on sides and bottom of ductwork over 18" wide and all rigid duct insulation with weld pins. Space fasteners 18” on center or less as required to prevent sagging.
L. Secure rigid board insulation to ductwork with weld pins. Apply insulation with joints firmly butted as close as possible to the equipment surface. Pins shall be located a maximum of 3” from each edge and spaced no greater than 12” on center.
M. Install weld pins without damage to the interior galvanized surface of the duct. Clip pins back to washer and cover penetrations with tape of same material as jacket. Firmly butt seams and joints and cover with 4” tape of same material as jacket. Seal tape with plastic applicator and secure with staples. All joints, seams, edges and penetrations to be fully vapor sealed with vapor retarding mastic.
N. Stop and point insulation around access doors and damper operators to allow operation without disturbing insulation or jacket material.
O. External supply duct insulation is not required where ductwork contains continuous 1” acoustical liner. Provide 4” overlap of external insulation over ends of acoustically lined sections.
P. Where insulated ductwork is supported by trapeze hangers, the insulation shall be installed continuous through the hangers. Drop the supporting channels required to facilitate the installation of the insulation. Where rigid board or flexible insulation is specified, install high density inserts to prevent the weight of the ductwork from crushing the insulation.
Q. Where insulated low temperature (below 45ºF) ductwork is supported by steel metal straps or wire ropes that are secured directly to the duct, the straps or ropes shall be completely covered with insulation and sealed to provide a complete vapor retarding barrier.
R. Where insulated duct risers are supported by steel channels secured directly to the duct, extend the insulation and vapor retarding jacketing to encapsulate the support channels.
S. Exterior Applications: Slope the top surface of the insulation a minimum of ¼” per foot to eliminate ponding and create positive drainage off of insulation.
T. Fiberglass Insulation:
    1. Seal edges, joints, seams, penetrations, and punctures with white mastic with a #20 glass fabric imbedded in the mastic, or tape to match the jacket.
    2. Butt joints: Firmly butted and sealed with a 3" wide, reinforced pressure sensitive tape to match insulation jacket.
    3. Flexible insulation:
        a. Maximum compression: 25%.
        b. Staple a minimum 2” lap on 6” centers with outward clinching staples. Cover staples with adhesive or tape to match the jacket.
        c. For ducts over 18" wide, secure insulation to the bottom side with weld pins or anchors maximum 18" centers.
    4. Semi-rigid insulation: Staple a minimum 2” lap on 3” centers with outward clinching staples. Cover staples with adhesive or tape to match the jacket.
U. Elastomeric:
    1. Miter cut fittings allowing sufficient length to prevent stretching.
    2. Seal seams and joints for vapor tight installation.
    3. For elastomeric insulation apply full bed of adhesive to both surfaces of seams and joints.
    4. Cover elastomeric insulation on systems operating below 40°F with vapor retarding mastic.
    5. Stagger joints of multiple layers to meet thickness requirements.

6. Adhere to ductwork and equipment with full coverage of adhesive.
7. Standing seams: Cover with minimum 1/2" of insulation.
8. Stagger joints of multiple layers to meet thickness requirements.

**3.8 DUCTWORK PROTECTIVE COVERINGS:**

A. In addition to the jackets specified in the duct insulation schedule below the following protective coverings are required:
B. Provide a protective self-adhering jacket (SAJ) for the following insulated ductwork:
   1. Exterior ductwork.

**3.9 DUCT INSULATION SCHEDULE:**

A. Provide duct insulation on new and existing remodeled ductwork in the following schedule:

| SERVICE | INSULATION TYPE | JACKET | THICKNESS |
|---|---|---|---|
| Exposed Supply Ducts(1) | Rigid Fiberglass | FSK | 2" |
| Concealed Supply Ducts | Flexible Fiberglass | FSK | 2" |
| All Ducts Located in Unconditioned Attics | Flexible Fiberglass | FSK | 3" |
| Exhaust and Relief Ducts Downstream of Motorized or Backdraft Dampers | Rigid Fiberglass | FSK | 2" |
| All Ducts Exposed to Weather | Polyisocyanurate | SAJ | 3” |

(1) Exposed supply branch ducts located in the space they are serving do not require insulation. Exposed supply main ducts running through spaces they serve shall be insulated as exposed supply ducts scheduled above.

END OF SECTION

## SECTION 23 09 00 - TEMPERATURE CONTROLS

### PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Electric Controls.
B. Direct Digital Controls.

### 1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Control components factory supplied as part of equipment controlled, unless specified otherwise.

### 1.3 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Control Dampers.

### 1.4 REFERENCES

A. All work shall conform to the following Codes and Standards, as applicable:

| | | |
|---|---|---|
| 1. | NFPA | National Fire Protection Association Standards. |
| 2. | NEC | National Electric Code and applicable local Electric Code. |
| 3. | UL | Underwriters Laboratories listing and labels. |
| 4. | UL 864 | UOJZ Fire Protective Signaling Systems. |
| 5. | UL 864 | UUKL Smoke Control. |
| 6. | UL 268 | Smoke Detectors. |
| 7. | UL 521 | Heat Detectors. |
| 8. | UL 1480 | Fire Alarm Signaling Devices. |
| 9. | UL 1971 | Visual Fire Alarm Signaling Devices. |
| 10. | UL 916 | Energy Management. |
| 11. | NFPA 70 | National Electrical Code. |
| 12. | NFPA 72 A/B/C/D/E/F/G/H | Signaling System Standards. |
| 13. | NFPA 90A | Standard For The Installation Of Air Conditioning And Ventilating Systems. |
| 14. | NFPA 92A/B | Smoke purge/control Equipment. |
| 15. | FM | Factory Mutual. |
| 16. | ANSI | American National Standards Institute. |
| 17. | NEMA | National Electric Manufacturer's Association. |
| 18. | ASME | American Society of Mechanical Engineer). |
| 19. | ASHRAE | American Society of Heating, Refrigerating and Air Conditioning Engineers. |
| 20. | AMCA | Air Movement and Control Association. |
| 21. | IEEE | Institute of Electrical and Electronic Engineers. |
| 22. | ASCII | American Standard Code for Information Interchange. |
| 23. | EIA | Electronics Industries Association. |
| 24. | OSHA | Occupational Safety and Health Administration. |
| 25. | ASTM | American Society for Testing and Materials. |
| 26. | FCC | Federal Communications Commission, including Part 15, Radio Frequency Devices. |
| 27. | ADA | Americans Disability Act. |
| 28. | CAN/ULC-S524 | Installation of Fire Alarm Systems. |
| 29. | CAN/ULC-S537 | Verification of Fire Alarm Systems. |
| 30. | CAN/ULC-S536 | Inspection and Testing Of Fire Alarm Systems. |

B. In the case of conflicts or discrepancies, the more stringent regulation shall apply.
C. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

## 1.5 SUBMITTALS

A. Shop drawing title block information:
   1. Project name.
   2. Project address.
   3. Subcontractor address.
   4. Sheet number.
   5. Subcontractor's in-house project identification number.
   6. Mechanical system represented.
   7. Latest revision date and number.
B. At a minimum, submit the following:
   1. Facilities Management System (FMS) network architecture diagrams including all Controllers and interconnections.
   2. Job-tailored schematics, sequences and flow diagrams.
   3. Points schedule for each real and virtual (software) point in the FMS, including:
      a. Tag.
      b. Point Type.
      c. System Name.
      d. Object Name.
      e. Expanded ID.
      f. Display Units.
      g. Address.
      h. Cable Destination.
      i. Terminal ID.
      j. Panel.
   4. A sample of each Graphic Display screen type and associated menu penetrations to show hierarchy and functional interrelationships.
   5. Detailed Bill of Material list for each Node, identifying quantity, part number, description, and optional features.
   6. Control Damper Schedule including a separate line for each damper and a column for each of the damper attributes, including:
      a. Tag.
      b. Damper Manufacturer.
      c. Damper Model.
      d. Damper Operator.
      e. Damper Classification.
      f. Blade Type (Opposed Blade / Parallel Blade).
      g. Duct Size.
      h. Damper Size.
      i. Pressure Drop.
      j. Actuator Type.
      k. Fail Position.
   7. Details of all FMS interfaces and connections to the work of other trades.
   8. Product data sheets for all products including software.
   9. Equipment specific checklists to be used for commissioning.
   10. Training provided, including outlines for each session.
   11. Description of installation wire color coding.
   12. For existing facilities, items B3 & B4 shall be approved by the engineer and the owner.
C. At a maximum, no more than three (3) sets of submittals should be issued for example:
   1. Damper Schedules.
   2. Flow Diagrams, Point Schedules, Sequences, etc.
   3. Graphics.

D. Mechanical system line diagram shall include:
   1. Mechanical components (supply fans, heating coils, cooling coils, etc.).
   2. Mechanical components present but not affected by the temperature control system (filters, etc.).
   3. Motor operated dampers in their relative locations.
   4. All field-mounted automatic control system sensing and control components.
   5. Controlled devices.
   6. Starter electrical wiring line diagram showing interlocks between the automatic control system, the respective starter, and any other interlocks not provided as part of the temperature control system (fire alarm, smoke alarm, etc.).
   7. List identifying each control system component shown on that drawing with the following component information:
      a. Name.
      b. Catalog description and designation (to be used when purchasing repair parts).

## 1.6 CONTRACT CLOSEOUT SUBMITTALS

A. Include the following:
   1. Shop drawing submittal revised to reflect the system in its as-built condition, along with first phase submittals.
   2. Set of operating instructions identifying the procedures to be employed to perform temperature control system operations.
   3. Information detailing preventive maintenance to be performed by the Owner.
   4. Subcontractor's system guarantee and system component warranties.
   5. Itemized list verifying that all equipment provided and installed per this contract has been set up to operate according to the specification.
B. Provide in a three-ring binder labeled with the title of the project.

## 1.7 QUALITY ASSURANCE

A. All work shall be installed by mechanics and technicians employed by an installer representing the manufacturer.

## 1.8 SEQUENCING AND SCHEDULING

A. Coordinate work and ensure system is completed and commissioned by Date of Substantial Completion.
B. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

## 1.9 DEFINITIONS

A. *Analog*: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.
B. *Binary*: A two-state system where an “ON” condition is represented by one discrete signal level and an “OFF” condition is represented by a second discrete signal level each separated by a defined deadband (also known as Digital).
C. *Control Sequence*: A programmed arrangement of software algorithms, logical computation, target values, and limits as required too attain the defined operational control objectives.
D. *Controller*: A digitally programmable entity existing on the FMS network.
E. *Derivative Control Algorithm*: The method of control in which the output is proportional to the rate of change of the input.

F. *Direct Digital Control (DDC)*: The control algorithms and defined arrangements included in the FMS software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative, and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.

G. *Facilities Management System (FMS)*: The integrated system of operational and functional elements, including equipment, software, programming, and associated materials, provided by the FMS Contractor and interfaced to the work of other related trades.

H. *Floating Control (Incremental Control)*: A form of modulating control where the controlled device is sent an increase - hold - decrease signal from two binary outputs working as a pair. The controlled device is driven from open to closed and back based on the time span the device is provided with an increase or decrease signal.

I. *FMS Contractor*: The single Contractor to provide the work of this Division. The Contractor shall be the primary manufacturer, installer, commissioner, and ongoing service provider for the FMS work.

J. *FMS Integration*: The functional, operational interconnections, and interfacing of all FMS work elements and controllers in compliance with all applicable codes, standards, and ordinances to provide a single coherent FMS as required by this Division.

K. *FMS Network (FMSN)*: The digital on-line real-time interconnected configuration of FMS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements. May exist as one or more fully interfaced and integrated sub-networks.

L. *Furnish*: The term “Furnish” and its derivatives when used in this Division shall mean supply at the FMS Contractor’s cost to the designated third party trade contractor for installation. FMS Contractor shall connect furnished items to the FMS, calibrate, test, commission, warrant, and document.

M. *Install*: The term “Install” and its derivatives when used in this Division shall mean receive at the jobsite and mount.

N. *Integral Control Algorithm*: The method of control in which the cumulative output is either the time spent out of setpoint or the amount out of setpoint.

O. *Proportional Control Algorithm (P)*: The method of control in which the amount of corrective action applied to a controlled device is relative to the amount of load sensed by the controller.

P. *Proportional Plus Derivative Control (PD)*: A controller which has both a Proportional algorithm and a Derivative algorithm. The algorithms operate in parallel to determine the control system response.

Q. *Proportional Plus Integral Control (PI)*: A controller which has both a Proportional algorithm and an Integral algorithm. The algorithms operate in parallel to determine the control system response.

R. *Proportional plus Integral Plus Derivative Control (PID)*: A controller which has a Proportional algorithm, an Integral algorithm, and a Derivative algorithm. The algorithms operate in parallel to determine the control system response.

S. *Protocol*: A defined set of rules and standards governing the on-line exchange of data between FMS controllers.

T. *Provide*: The term “Provide” and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, commission, warrant, document, and supply the associated required services ready for operation.

U. *Wiring*: The term “Wiring” and its derivatives when used in this Division shall mean provide the FMS wiring and terminations.

V. The use of words in the singular in these Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.

W. Headings, paragraph numbers, titles, shading, bolding, underscores, clouds, and other symbolic interpretation aids included in the Division documents are for general information only and are to assist in the reading and interpretation of these Documents. They do not form a formal part of the Documents and may not be consistent or complete in their use throughout the Documents.

X. The following abbreviations and acronyms may be used in describing the work of this Division:

1. ADC - Analog to Digital Converter.
2. AI - Analog Input.
3. ANSI - American National Standards Institute.
4. AO - Analog Output.
5. AWG - American Wire Gauge.
6. BI - Binary Input.
7. BO - Binary Output.
8. DAC - Digital to Analog Converter.
9. DDC - Direct Digital Control.
10. FMS - Facilities Management System.
11. FMSN - Facility Management System Network.
12. GUI - Graphical User Interface.
13. HOA - Hand-Off-Auto.
14. ID - Identification.
15. IEEE - Institute of Electrical and Electronics Engineers.
16. I/O - Input/Output.
17. LED - Light Emitting Diode.
18. MCC - Motor Control Center.
19. NC - Normally Closed.
20. NIC - Not In Contract.
21. NO - Normally Open.
22. OWS - Operator Workstation.
23. OAT - Outdoor Air Temperature.
24. P - Proportional Control Algorithm.
25. PD - Proportional + Derivative Control Algorithm.
26. PI - Proportional + Integral Control Algorithm.
27. PID - Proportional + Integral + Derivative Control Algorithm.
28. RF - Radio Frequency.
29. RFI - Radio Frequency Interference.
30. RH - Relative Humidity.
31. RTD - Resistance Temperature Device.
32. SPDT - Single Pole Double Throw.
33. SPST - Single Pole Single Throw.
34. UPS - Uninterruptible Power Supply.
35. VAC - Volts, Alternating Current.
36. VAV - Variable Air Volume.
37. VDC - Volts, Direct Current.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. EcoStruxure / Schneider Electric – Installed by Total Mechanical Inc. (extension of existing system).

## 2.2 FMS ARCHITECTURE

A. General:
   1. The FMS shall consist of a number of Controllers and associated equipment connected by industry standard network practices. All communication between Controllers shall be by digital means only.
   2. The FMS network shall, at minimum, be comprised of the following:
      a. Network processing, data storage and communication equipment including file servers.
      b. Routers, bridges, switches, hubs, modems and similar communications equipment.
      c. Active processing Controllers including field panels.
      d. Intelligent and addressable elements and end devices.
      e. Third-party equipment interfaces.
      f. Other components required for a complete and working FMS.
   3. The FMS shall support auto-dial/auto-answer communications to allow FMS Controllers to communicate with other remote FMS Controllers via standard telephone lines.
   4. The principal network equipment shall be standard products of recognized major manufacturers available through normal PC vendor channels.

B. Network:
   1. FMSN shall incorporate a primary Tier 1 network. At the Contractor's option, the FMS may also incorporate integrated secondary Tier 2 and tertiary Tier 3 sub-networks.
   2. FMSN shall utilize an open architecture with the following minimum features:
      a. Utilizes standard Ethernet communications and operates at a minimum speed of 100Mb/sec.
      b. Connection to devices via BACnet.
      c. Connection to devices via LonMark.
      d. Connection to devices via ModBus.
   3. FMSN shall support both copper and optical fiber communication media.
   4. Third-Party Interfaces:
      a. FMS shall integrate real-time data from systems supplied by other trades as required in Part 3.
      b. FMS shall include necessary hardware and software to allow data communication between the FMS and systems supplied by other trades.

C. Uninterruptible Power Supply (UPS):
   1. Each FMS Controller, except Application Controllers assigned to terminal HVAC systems, shall be powered with UPS power to provide 15 minutes of back-up for the controller and all field devices, (i.e. actuators, transmitters relays, end devices etc.).
   2. UPS shall be sized for 50% spare capacity. The UPS shall be complete with batteries, external bypass, and line conditioning.
   3. If, after 10 minutes on UPS power, the normal power has not returned start the automatic orderly predefined shutdown. The complete shutdown shall be completed before UPS power is exhausted.

D. Power Fail / Auto Restart:
   1. Provide an automatic orderly predefined shutdown of parts or all of the FMS following total loss of power to parts or all of the FMS. Archive and annunciate time and details of power failure.
   2. Provide an automatic orderly and predefined startup of parts or all of the FMS following total loss of power to those parts or all of the FMS. Archive and annunciate time and details of power restoration.
   3. Provide an orderly and predefined scheduling of the following resulting from the automatic restart process:
      a. Controlled return to normal.

b. Automatic time schedules.
c. Operation of controlled equipment.

4. Maintain the FMS real-time clock operation during periods of power outage for a minimum of 168 hours (one week).

E. Downloading And Uploading:

1. Generate FMS software-based sequences, database items and associated operational definition information and user-required revisions to same on designated OWS, and the means to download same to the associated application controller.
2. Upload FMS operating software information, database items, sequences and alarms to the designated OWS with automatic archiving of same on the OWS.

F. The functions of this Part shall be governed by the Codes, Approvals and Regulations applying to each individual FMS application.

## 2.3 SOFTWARE

A. HVAC Application Software:

1. Event Messaging: Provide automatic execution of user-defined messages on occurrence of each defined FMS real-time event including equipment/point status change, approaching limit or alarm, and time of day.
2. Auto Alarm Lockout: Provide scheduled and automatic lockout of alarm annunciation from equipment during non-normal operating conditions including shutdown, emergency power operation, and fire alarm.
3. Demand Limiting: Software shall limit excess utility charges caused by uncontrolled demand. Prioritize the demand limiting actions based on FMS parameters.
4. System Restart: Upon restoration of the AC power to a Controller, automatically restart all equipment and restore all loads to the state as required by the FMS. Provide appropriate time delays to prevent demand surges or overload trips.
5. Runtime Totalization: Automatically sample, calculate and store runtime hours for binary input and output points as listed in the point schedule of this specification.
6. Analog/Pulse Totalization: Sample, calculate and store consumption totals on a daily, weekly, or monthly basis for user-selected analog and binary pulse input-type points.

B. Reports:

1. Generate and direct to one or more of the following: OWS display, printer, or archive at user's option.
2. Provide the following reports, at a minimum:
   a. All points in the FMS.
   b. All points in each FMS application.
   c. All points in a specific Controller.
   d. All points in a user-defined group of points.
   e. All points currently in alarm in an FMS application.
   f. All points locked out in an FMS application.
   g. All FMS schedules.
   h. All user defined and adjustable variables, schedules, interlocks and the like.
   i. FMS diagnostic and system status reports.
3. Provide for the generation by the user of custom reports as specified in Part 3.
4. Provide all applicable standard reports of the FMS manufacturer.

C. Alarms:

1. Existing Operator Work Station (OWS) shall annunciate alarms generated by the FMS.
2. OWS software shall, at the minimum, provide the following functions:
   a. Log date and time of alarm occurrence.
   b. Generate a "Pop-Up" window, with audible alarm.
   c. Allow a user, with appropriate security level, to acknowledge or disable an alarm.

d. Audit Trail:
1). Permanent storage on OWS hard drive or, if available, file server hard drive.
2). Record user acknowledgment, deletion, or disabling of an alarm.
3). Include name of user, alarm, action taken on alarm, and time/date stamp.

3. The FMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions
4. The FMS shall annunciate application alarms at minimum, as required by Part 3.

D. Color Graphic Displays:
1. Generate and execute an unlimited number of graphic displays.
2. Displays shall provide animation based on real-time FMS data that is acquired, derived, or entered.
3. Allow user to change values (setpoints) and states in controlled equipment.
4. Provide a graphic editing tool for creation and editing of graphic files.
5. Provide a user expandable symbol library containing all symbols used to represent components of an FMS.

E. Schedules:
1. Provide a spreadsheet-type schedule input form for time-of-day scheduling and override scheduling.
2. Provide the following spreadsheet types, at a minimum:
a. Weekly schedules.
b. Temporary override schedules.
c. Special “Only active if today is a holiday” schedules.
d. Monthly schedules.
3. Provide for each system or sub-system in the FMS.
4. Include all commandable system points. Each point shall have a unique schedule of operation relative to the system use schedule, at user’s discretion. Scheduling and rescheduling of points shall be accomplished via the system schedule spreadsheets.
5. Provide monthly calendars for a 24-month period.
6. Holidays and special days shall be user-selected with the pointing device or keyboard. Return to normal equipment operation weekly schedule after day passes.

F. Historical trending and data collection:
1. Provide trend and point history data storage for all FMS points and values as selected by user.
2. Store data in a manner allowing custom queries and reports using industry-standard software tools.
3. Provide the following statistical functions on the historical database, at a minimum:
a. Average.
b. Arithmetic mean.
c. Maximum/minimum values.
d. Range – difference between minimum and maximum values.
e. Standard deviation.
f. Sum of all values.
g. Variance.

G. Internet/Intranet Browser:
1. Provide a color graphic and textual interface to access FMS data via the Internet or Intranet.
2. Browser shall:
a. Reflect any changes made to the FMS without additional programming.
b. Work in conjunction with implemented corporate security measures.
c. Allow users to navigate and command FMS using the same format as the OWS.
d. Be an industry-standard browser.

e. Provide user password access control.
f. Allow user to create, edit and view groups of FMS data points.
g. Provide navigation tools for moving between the views, for gaining access to on-line help, and for logging out of the system.

H. Annunciation:
1. General:
a. Provide automatic alphanumeric paging of personnel for user-defined FMS events.
b. Allow users to modify phone number or message to be displayed on the pager through the system software.
c. Utilize schedules to send messages to personnel that are “on-call.”
d. Provide schedules for each of the following annunciation methods:
1). Paging.
2). Text messaging.
3). Email.
2. Paging:
a. Support both numeric and alpha-numeric pagers, using Alphanumeric, PET, or IXO Protocol at the Owner’s option.
b. Provide a modem for connection to the paging service.
3. Text Messaging:
a. Provide an SMTP email server to send text messages through.
b. Coordinate email addresses with Owner’s phone carrier.
4. Email:
a. Provide an SMTP email server to send email through.
b. Coordinate email addresses with Owner.

## 2.4 CONTROLLERS

A. General:
1. Provide all monitoring, controlling, and information gathering/storage controllers for each specific application in application dedicated control panels (for example: Control Panels - HVAC, Fire, Security etc.).
2. Programmable and governed by the requirements of their applicable codes, approvals, and regulations.
3. Designed, packaged, installed, programmed, and commissioned in consideration of their specific service and prevailing operating conditions. Controllers shall be a proven standard product of their original manufacturer and not a custom product for this Project.
4. Failure of a Controller shall not cause failures or non-normal operation at any other Controller other than the possible loss of active real-time information from the failed Controller.
5. Ancillary Controller equipment, including interfaces and power supplies, shall not be operated at more than 80% of their rated service capacity.
6. The Controller shall download and upload configuration data, both locally at the Controller and via the FMS communications network.

B. HVAC Controllers:
1. Controllers shall provide both standalone and networked direct digital control of HVAC systems.
2. A dedicated HVAC Controller shall be configured and provided for each HVAC system device (air handling unit, chiller, boiler, VAV Box, Unit Heater, Fan Coil Unit, Cabinet Heater, Heat Pump, Fan Powered Box, etc).
3. Each dedicated Controller shall retain programs, control algorithms, and setpoint information for at least 72 hours in the event of a power failure, and shall return to normal operation upon restoration of power.
4. Each HVAC Controller shall report its communication status to the FMS. The FMS shall provide a system advisory upon communication failure and restoration.

5. Ethernet Connection:
   a. Provide an Ethernet connection on each controller for connection to a portable OWS.
   b. Provide communication for the following functions, after passwords have been verified:
      1). Indication of system performance and setpoints.
      2). Adjustment of setpoints and starting/stopping of equipment.

## 2.5 INPUT DEVICES

A. Air Flow – Binary:
   1. Materials:
      a. Paddle: Stainless steel.
      b. Enclosure: Cold drawn steel.
      c. Cover: Cold drawn steel.
   2. Rating:
      a. UL, CSA.
      b. Contact Rating: As required for proper system operation.
   3. Mounting: Duct insertion.
   4. Range: 500 to 2000 FPM.
   5. Output: Snap-acting SPDT contact opens/closes on positive air flow.
   6. Special:
      a. Automatic reset.
      b. Complete installation kit.

B. Air Flow Differential Pressure – Binary:
   1. Rating:
      a. UL, CSA.
      b. Contact Rating: As required for proper system operation.
   2. Mounting: Duct insertion.
   3. Range: 0.15” to 12.0” WC.
   4. Sensitivity at Minimum Setpoint: 0.07” WC.
   5. Protection: Overpressure to 1 PSIG.
   6. Output: SPDT contact opens/closes on pressure rise/fall.
   7. Special:
      a. Snap-acting contact opens/closes on differential pressure rise/fall.
      b. Field-adjustable setpoint via setpoint scale on unit.
      c. Complete installation kit including mounting bracket, static pressure tips, tubing, and fittings.

C. Air Flow Differential Pressure – Analog:
   1. Case Materials: Fire-retardant, glass-filled polyester.
   2. Rating: ANSI, NIST, ISO 9001.
   3. Mounting: Screw.
   4. Range: Dependent upon application.
   5. Accuracy: ± 0.5% FS.
   6. Protection:
      a. Maximum Line Pressure: 10 PSI.
      b. Overpressure: 10 PSI in positive or negative direction.
   7. Output: Analog.
   8. Options: Uni-directional or bi-directional as required by application.
   9. Special:
      a. Accessible zero and span adjustments on top of case.
      b. Complete assembly with mounting base.
      c. With barbed fittings suitable for attaching ¼” push-on tubing.

D. Air Flow Differential Pressure – Resettable – Analog and Binary:
   1. Rating:
      a. UL, CSA.

b. Contact Rating: As required for proper system operation.
2. Mounting: Duct insertion.
3. Range: 0.4" ± 0.06" WC to 12.0" WC.
4. Sensitivity at Minimum Setpoint: 0.06” WC.
5. Protection: Overpressure to 1 PSIG.
6. Output:
   a. Analog.
   b. Binary: SPST NC contact.
7. Special:
   a. Snap-acting contact opens on differential pressure rise.
   b. Manual reset or automatic reset as required by specification.
   c. Field-adjustable setpoint and differential.
   d. Complete installation kit including mounting bracket, static pressure tips, tubing, and fittings.

E. Building Differential Pressure – Analog:
1. Case Materials: Fire-retardant, glass-filled polyester.
2. Rating: ANSI, NIST, ISO 9001.
3. Mounting: Screw.
4. Range: Dependent upon application.
5. Accuracy: ± 0.5% FS.
6. Protection:
   a. Maximum Line Pressure: 10 PSI.
   b. Overpressure: 10 PSI in positive or negative direction.
7. Output: Analog.
8. Options: Uni- or bi-directional as required by application.
9. Special:
   a. Accessible zero and span adjustments on top of case.
   b. Complete assembly with mounting base.
   c. With barbed fittings suitable for attaching ¼” push-on tubing.

F. Current – Analog:
1. Power Source: Induced by Electrical Load Monitored.
2. Rating: UL.
3. Mounting:
   a. Conductor mounted.
   b. Split-core configuration.
4. Range: 1 to 135A continuous (in-rush protected). Provide a current transformer, in addition to current sensor, if current draw exceeds 135A.
5. Accuracy: ± 2% full scale.
6. Protection: 600VAC rms isolation.
7. Output: Analog.
8. Special:
   a. 5 year limited warranty.
   b. Sensor trip status LED and power status LED on unit.

G. Current – Binary:
1. Power Source: Induced by Electrical Load Monitored.
2. Rating: UL.
3. Mounting:
   a. Conductor mounted.
   b. Split or solid-core configuration.
4. Range: 1 to 135A continuous, 1.0A @ 30 VAC/DC.
5. Protection: 600VAC rms isolation.
6. Output: Non-polarity-sensitive Snap-acting NO SPDT contact.
7. Special:
   a. 5 year limited warranty.
   b. Sensor trip status LED and power status LED on unit.
   c. Setpoint adjustment on unit.

H. Damper Position – Analog:
   1. Manufacturer: Kele or equal.
   2. Model: TT-470 or equal.
   3. Sensor Type: Solid state orientation sensor.
   4. Sensing Angle: Programmable range from ±10° to 360° rotation.
   5. Mounting:
      a. Direct-mount to damper shaft.
      b. Outside of duct.
   6. Output: Analog.
   7. Special: Red LED power indication.
I. Damper Position – Binary:
   1. Switch Materials: Stainless steel roller ball.
   2. Rating: As required for proper system operation.
   3. Mounting: Direct-mount to damper shaft.
   4. Range: 15° angle between circuit make and break.
   5. Output: SPDT contact.
   6. Special:
      a. Maintenance free.
      b. Adjustable.
J. Duct Relative Humidity – Analog:
   1. Sensing Element Materials: All polymer.
   2. Rating: 94-5V flammability rated per UL 94.
   3. Mounting: Duct insertion.
   4. Range:
      a. 32°F to 131°F (0 to 55°C).
      b. 0% to 100% RH, non-condensing.
      c. 85°F (29°C) maximum dew point.
   5. Accuracy: ± 2% RH.
   6. Output:
      a. Relative Humidity: Analog.
      b. Temperature: Analog.
   7. Special:
      a. Must use National Institute of Standards and Technology (NIST) traceable calibration.
      b. Complete installation kit.
K. Duct Temperature – Averaging – Analog:
   1. Materials: Nickel, platinum, RTD, or thermistor.
   2. Mounting: Duct averaging (back and forth at equal spacing covering entire duct cross-section).
   3. Range:
      a. Probe Assembly: -50°F to 220°F (-46 to 82°C).
      b. Conduit Box: -50°F to 122°F (-46 to 50°C).
   4. Accuracy: ± 0.34°F at 70°F.
   5. Protection: Conduit Access Box: Rigid PVC plastic
   6. Output: Analog.
   7. Special: Complete installation kit including sensor holder with retainer, mounting plate with locknut, and conduit enclosure with cover.
L. Duct Temperature – Single Point – Analog:
   1. Materials: Thin film nickel, platinum, RTD, or thermistor.
   2. Mounting: Duct insertion.
   3. Range:
      a. Probe Assembly: 50°F to 220°F (-46 to 82°C).
      b. Conduit Box: 50°F to 122°F (-46 to 50°C).
   4. Accuracy: ± 0.34°F at 70°F.
   5. Protection:
      a. Sensor: ¼” OD stainless steel probe.

b. Conduit Access Box: Rigid PVC plastic.
6. Output: Analog.
7. Special: Complete installation kit including sensor holder with retainer, mounting plate with locknut, and conduit enclosure with cover.

M. Low Temperature Cutout Thermostat – Binary:
1. Materials: Vapor pressure element.
2. Contact Rating: As required for proper system operation.
3. Mounting: Duct mount (back and forth at equal spacing covering entire duct cross-section at air-leaving side of coil).
4. Range: 15°F to 55°F.
5. Differential: Minimum 5°F in automatic reset application.
6. Protection: Maximum 400°F overrun temperature at element.
7. Output: Two (2) SPST contacts.
8. Special:
a. Snap-acting contacts open/close on temperature rise/fall (one closes on temperature drop, one opens on temperature drop).
b. Setpoint adjustment on unit.
c. Manual reset or automatic reset as required by control sequence.

N. Occupancy Sensor / Motion Detection- Binary:
1. Manufacturer: Watt Stopper.
2. Model: DT-355.
3. Rating:
a. UL, cUL.
b. Contact Rating: As required for proper system operation.
4. Mounting: Ceiling mount.
5. Coverage Area: 36’ x 36’ field of view.
6. Sensitivity: Adjustable from 20% to 100% of maximum sensitivity.
7. Protection: Ambient Operating Conditions:
a. Temperature: 32°F to 95°F.
b. Relative Humidity: 5% to 95% RH, non-condensing.
8. Time Delay: Do not utilize internal time delays in sensor for control applications. Provide software time delays, as required.
9. Input Power: 24 VAC.
10. Output: SPST NO contact with automatic reset, LED Indicator flashes when motion is detected.
11. Special:
a. Dual technology with both passive infrared sensing technology and ultrasonic diffusion technology.
b. Snap-acting contact closes on motion detection after time delay.
c. Complete installation kit including wallplate.
d. Warranty: 5 year.

O. Outdoor Relative Humidity – Analog:
1. Housing Materials: ABS plastic.
2. Housing Rating: IP65 NEMA 4.
3. Mounting: Outside wall or roof.
4. Range: -40°F to 140°F, 10 to 90% RH.
5. Accuracy: ± 3% at 68°F.
6. Output: Analog.
7. Special:
a. Accuracy varies not more than +2% over two years.
b. Maintenance-free.
c. Calibration-free.
d. Complete installation kit including mounting bracket and weather shield to protect sensing element from solar radiation and precipitation.
e. Three year warranty.

P. Outdoor Temperature – Single Point – Analog:
1. Materials: Nickel, platinum, RTD, or thermistor.

2. Mounting: Outside of building on wall.
3. Outdoor Mount: Rain proof, perforated cover.
4. Range:
   a. Probe Assembly: -50°F to 220°F (-46°C to 82°C).
   b. Conduit Box: -50°F to 122°F (-46°C to 50°C).
5. Accuracy: ± 0.34°F at 70°F.
6. Protection: Conduit Access Box: Rigid PVC plastic.
7. Output: Analog.
8. Special: Complete installation kit including outdoor air shield and conduit enclosure with cover.

Q. Space Relative Humidity – Analog:
1. Sensing Element Materials: All polymer.
2. Duct Probe Material Rating: 94-5V flammability rated per UL 94.
3. Mounting: Standard North American wall box.
4. Range:
   a. 32°F to 122°F.
   b. 0% to 100% RH, non-condensing.
   c. 85°F (29°C) maximum dew point.
5. Relative Humidity Accuracy: ±2% to ±5% RH based upon application.
6. Output: Analog.
7. Special:
   a. Field-selectable direct or reverse action.
   b. NIST traceable calibration.
   c. Complete installation kit including cover, base, faceplate, drywall mounts and spacers.

R. Space Temperature – Single Point Monitoring – Analog:
1. Materials: Thin film nickel, platinum, RTD, or thermistor.
2. Mounting: Wall Mount.
3. Range:
   a. Probe Assembly: -50°F to 220°F (-46°C to 82°C).
   b. Conduit Box: -50°F to 122°F (-46°C to 50°C).
4. Accuracy: ± 0.34°F at 70°F.
5. Sensor Protection: ¼” OD stainless steel probe.
6. Output: Analog.
7. Special: Complete installation kit including cover, base, faceplate, drywall mounts and spacers.

S. Space Temperature – Single Point Monitoring and Control – Analog:
1. Materials: Thin film nickel, platinum, RTD, or thermistor.
2. Mounting: Standard Bases for surface mount or U. S. Wallbox mounting.
3. Range:
   a. Probe Assembly: -50°F to 220°F (-46°C to 82°C).
   b. Conduit Box: -50°F to 122°F (-46°C to 50°C).
4. Accuracy: ± 0.34°F at 70°F.
5. Protection:
   a. Ambient Operating Conditions: 32°F to 131°F.
   b. 0 to 100% RH, non-condensing.
   c. 85°F (29°C) maximum dew point.
6. Output:
   a. Space Temperature Setpoint: Analog.
   b. Space Temperature: Analog.
7. Accessories:
   a. Integral momentary pushbuttons for the following:
      1). Override of unoccupied cycle.
      2). Change to temperature setpoint.
   b. LED indication of mode of operation.
   c. LED indication of setpoint and room temperature.

8. Special: Complete installation kit including cover, base, faceplate, drywall mounts and spacers.

T. Space Thermostat – Electric – Binary:
1. Materials:
   a. Sensing Element: Liquid-charged.
   b. Thermometer: Bi-metal.
   c. Base: Cold rolled steel.
   d. Cover: Thermoplastic.
2. Rating: Minimum contact rating equal to electrical load of device being controlled.
3. Mounting: Vertical or horizontal wall mount in wall box.
4. Range:
   a. Thermostat: 40°F to 90°F.
   b. Thermometer: 50°F to 90°F.
5. Differential:
   a. Heating: 1.75°F.
   b. Cooling: 2.25°F.
6. Protection: Ambient Operating Temperature - 0 to 105°F.
7. Output: SPDT contact.
8. Special: Snap-acting contacts open/close on temperature rise/fall.

U. Electrical Power Monitoring – Analog – Simple:
1. Rating: ANSI C12.1 metering standards.
2. Mounting: Split-core.
3. Range: Dependent upon application.
4. Accuracy: ± 1% from 5% to 100% of the rated at 0-60°C.
5. Protection:
   a. Internal Isolation: 2000 VAC rms.
   b. Case Isolation: 600 VAC.
   c. Maximum Primary Current: 2400 A continuous per phase.
6. Output:
   a. Consumption (kWH).
   b. Demand (kW).
7. Special:
   a. Store kWH in non-volatile memory.
   b. One current transformer per power conductor.
   c. Removal of conductors not required for meter installation/removal.

V. Gas Detection – Analog and Binary - CO and NO2:
1. Rating: Alarm Contact - As required for proper system operation.
2. Mounting: Wall-mount.
3. Range:
   a. CO: 0-250 ppm.
   b. $NO_2$: 0-10 ppm.
4. Accuracy: ±3%.
5. Protection: Operating Temperature: 32°F to 104°F.
6. Output:
   a. 4 to 20 mA proportional, 1000 ohms maximum.
   b. DPDT alarm contact.
7. Special:
   a. S1-type sensing technology (electrochemical sensor for toxic gases, catalytic combustion for combustible gases).
   b. Alarm Relay Setpoint:
      1). CO: 35 ppm.
      2). $NO_2$: 1 ppm.
      3). Green LED indication of normal operation.
      4). Audible alarm of 65 dBA at 3 feet minimum.
      5). Dedicated power source for each detector.

W. Gas Detection – Analog and Binary - CO2:
1. Materials: ABS plastic housing.

2. Rating: Alarm Contact - As required for proper system operation.
3. Mounting: Wall or duct-mounted depending upon application.
4. Range: 0-2000 ppm.
5. Accuracy: ± 5% of reading or ± 75 ppm.
6. Response Time: Less than one (1) minute.
7. Protection:
   a. Operating Temperature Range: 32°F to 122°F.
   b. Operating Humidity Range: 0 to 99% RH (non-condensing).
8. Output:
   a. Analog: 4-20 mA or 0-10 VDC (field selectable).
   b. Binary: SPST contact closes on rise in gas concentration.
9. Special:
   a. Non-Dispersive Infra-Red (NDIR) sensing technology.
   b. Maximum Drift: ± 75 ppm per year.
   c. Field setpoint adjustment for alarm relay.
   d. Complete installation kit including duct inlet and outlet ports, filter, tubing and hardware for duct applications.
   e. LED display of operating parameters.

X. Natural Gas Flow Monitoring – Analog – Insertion Style:
1. Manufacturers:
   a. InnovaMass FCI ST51.
   b. Onicon F-5500 Series.
   c. Rosemount conditioning orifice plate style.
   d. Approved equal.
2. Compatibility
   a. 2” to 24” pipe / line size.
   b. Natural Gas.
   c. Minimum Turndown: 100:1.
   d. FM, CSA/CRN: Class I, Div. 1, Groups B,C,D; Class I, Div. 2, Groups A-D
   e. Warranty: 1 Year
   f. Flow Transmitter Operating Temperature: 0°F to 140°F
   g. Accuracy: +/-2% reading, +/-0.5% full scale
3. Enclosure: NEMA 4X, aluminum, dual conduit ports, epoxy coated.
4. Analog Output Signals
   a. Dual 4-20 mA Analog.
   b. Optional 0-500 HZ pulse for totalizer.
5. Input Power
   a. 18 Vdc to 36 Vdc, 6 Watts Max.
   b. 85 Vac to 265Vac (CE Mark Approval from 100 to 240 Vac), 12 Watts Max.
6. Communication Port: RS-232C
7. Digital Display
   a. LCD Screen.
   b. Two-line by 16 Character.
   c. Rotatable display for various mounting configurations.
8. Flow Element
   a. Installation Type: Insertion.
   b. Type: Thermal Dispersion.
   c. Material:
      1). 316 Stainless Steel body.
      2). Hastelloy C thermowell sensors.
      3). 316 Stainless steel compression fitting.
      4). Stainless steel ferrule.
   d. Process Connection: 3/4” MNPT Stainless Steel

## 2.6 CONTROLLED DEVICES

A. Actuator – Damper – Modulating – Electric:
   1. Materials:
      a. Enclosure:
         1). Indoors: NEMA 2.
         2). Outdoors: NEMA 4 enclosure that has removable covers with clasps (no sheet metal screws).
      b. Actuator: UL873, CSA.
   2. Mounting: Direct-mount on damper blade pin.
   3. Range: 30° to 90°, CW or CCW, mechanically limited to 93°.
   4. End to End Stroke: 150 seconds, 25 seconds return to normal for spring return.
   5. Protection: Electronic stall protection throughout entire operating range to deactivate actuator motor when overload is detected.
   6. Duty cycle: Rated for 65,000 cycles.
   7. Control Input: Analog.
   8. Position Feedback: Analog matching control input.
   9. Power Input: Nominal 24 VAC.
   10. Output: Torque output of actuator matches needs of application to provide smooth modulation, full closeoff and complete opening against system pressures.
   11. Options:
      a. Spring return where specified.
      b. [Two (2) SPDT auxiliary switches as required by Control Sequence.]
      c. Visual position indicator.
   12. Special:
      a. Manual override.
      b. Field-selectable rotational/spring return direction.
      c. Field-adjustable zero and span.

B. Actuator – Damper – Two-Position – Electric:
   1. Materials:
      a. Enclosure:
         1). Indoors: NEMA 2.
         2). Outdoors: NEMA 4 enclosure that has removable covers with clasps (no sheet metal screws).
      b. Actuator: UL873, CSA.
   2. Mounting: Direct-mount on damper blade pin.
   3. Range: 30° to 90°, CW or CCW, mechanically limited to 93°.
   4. End to End Stroke:
      a. 150 seconds at 24 VAC.
      b. 75 seconds at 120 VAC.
      c. 25 seconds return to normal for spring return.
   5. Protection: Electronic stall protection throughout entire operating range shall deactivate actuator motor when overload is detected.
   6. Duty cycle: Rated for 65,000 cycles.
   7. Control Input: 24 VAC.
   8. Power Input: 24 VAC / 120 VAC.
   9. Output: Torque output of actuator matches needs of application to provide full closeoff and complete opening against system pressures.
   10. Options:
      a. Spring return where specified.
      b. [Two (2) SPDT auxiliary switches as required by Control Sequence.]
      c. Visual position indicator.
   11. Special:
      a. Manual override.
      b. Field-selectable rotational/spring return direction.

c. Field-adjustable zero and span.

C. Damper – Control – Airfoil:
1. Materials:
a. Frame: Galvanized steel.
b. Blades: Aluminum in airfoil shape.
c. Linkage: Zinc-plated rolled steel.
d. Bearings: Stainless steel.
e. Seals: Santoprene or silicone.
f. Jamb Seals: Self-compensating stainless steel.
2. Rating: Shall be tested according AMCA Standard No. 500 Test Methods for Louvers, Dampers and Shutters; Fully-open pressure drop shall not exceed 0.10” WC for a 48” by 48” damper with an air approach velocity of 2000 FPM.
3. Mounting: Duct.
4. Accessories: Blade-to-blade linkage kits and pin-to-pin coupling kits required for proper field assembly of multiple panel dampers.
5. Special:
a. Individual damper blades not more than 8” in height.
b. Replaceable seals.

D. Damper – Control – Thermal Barrier/Outside Wall:
1. Manufacturers:
a. Arrow.
b. Ruskin.
c. T. A. Morrison & Co. Inc. (TAMCO).
2. Materials:
a. Frame:
1). Thickness: [0.080”] [0.125”].
2). Width: 5”.
3). Extruded aluminum (6063T5 or 6063T6).
4). Polystyrene insulation.
5). [Thermally broken.]
b. Blades:
1). Thickness: 0.080”.
2). Width: 6”.
3). Extruded aluminum (6063T5 or 6063T6).
4). Airfoil profiles.
5). Internally insulated with non-CFC expanded polyurethane foam.
6). Thermally broken.
c. Blade Gaskets: Extruded EPDM elastomer.
d. Jamb Seals: Polycarbonate.
e. Linkage: Corrosion resistant aluminum, zinc- and nickel-plated steel.
f. Inner Bearings: Celcon.
g. Outer Bearings: Polycarbonate.
h. Seals: Extruded silicone.
3. Rating: Complete blade shall have an insulating factor of R-1.2 according to ASTM C-1363-97.
4. Operating Range: -40°F to 200°F.
5. Pressure Drop: Pressure drop of a fully open 48" x 48" damper shall not exceed 0.04" w.g. at 1000 fpm.
6. Mounting: Wall or duct.
7. Leakage: Air leakage through a 48" x 48" damper shall not exceed 4.12 CFM/SF against 4" w.g. differential static pressure at standard air. Standard air leakage data to be certified under the AMCA Certified Ratings Program.
8. Accessories: Blade-to-blade linkage kits and pin-to-pin coupling kits required for proper field assembly of multiple panel dampers.

## 2.7 OTHER DEVICES

A. Cable:
   1. General: Plenum-rated, shielded, stranded, color-coded and labeled per application and point type.
   2. Sensor Wiring: Minimum 24 AWG.
   3. 24 VAC Power Wiring: Minimum 18 AWG.
B. Control Relays:
   1. Materials: Contacts – Silver.
   2. Rating:
      a. UL Listed, UL916, UL864.
      b. Contact Rating: As required for proper system operation.
   3. Mounting:
      a. Panel: DIN rail.
      b. Field: Surface mount.
   4. Protection (Operating Temperature Range): -30°F to 140°F.
   5. Output: SPDT contacts.
   6. Special:
      a. LED indicating relay activation.
      b. Built-in hand-off-automatic override switch.
C. Panels – Metal:
   1. Materials: 6063-T5 aluminum alloy with non-removable piano hinge, spanning the entire height of the panel.
   2. Mounting: Wall, surface.
   3. Rating: UL listed.
   4. Protection: Lockable cover.
D. Panels – Non-Metal:
   1. Rating: UL 916 Listed and CSA certified.
   2. Mounting: Wall, surface.
   3. Protection:
      a. Lockable cover.
      b. Removable door.
      c. Ground bonding plane inside panel.

# PART 3 EXECUTION

## 3.1 GENERAL

A. Coordinate location of all devices with other trades to maintain NEC required clearances.

## 3.2 FMS ARCHITECTURE

A. Provide tie-ins to Owner's network infrastructure in telecommunications closets/rooms.
B. Tie-in to Owner's network infrastructure to access FMS through internet browser.
C. Coordinate tie-ins to Owner's network infrastructure with Owner.

## 3.3 INSTALLATION PRACTICES

A. Wiring – General:
   1. Provide all conduit, wiring, accessories and wiring connections required for the installation of the Facility Management System unless specifically shown on the Electrical Drawings under Division 27 Electrical.
   2. All wiring shall comply with the requirements of applicable portions of Division 27 and all local and national electric codes, unless specified otherwise in this section.

3. FMS wiring materials and installation methods shall comply with FMS manufacturer recommendations.
4. The sizing, type, and provision of cable, conduit, cable trays, and trunking shall be the design responsibility of the FMS Contractor.
5. If complications arise, due to the incorrect selection of cable, cable trays, trunking, and/or conduit by the FMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.
6. Perform circuit tests using qualified personnel only.
7. Provide necessary instruments and equipment to demonstrate that all circuits are:
   a. Continuous and free from short circuits and grounds.
   b. Free from unspecified grounds.
   c. Resistance to ground is no less than 50 megaohms.
   d. Free from induced voltages.
8. Provide complete testing for all cables used under this Contract. Provide all equipment, tools, and personnel as necessary to conduct these tests.
9. Install all wiring in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2”.
10. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
11. Install conduits and raceways level, plumb, at right angles to the building lines, and follow the contours of the surface to which they are attached.

12. Flexible Metal Conduit:
    a. Provide for vibration isolation.
    b. Limit lengths to 3 feet when terminating to vibrating equipment.
    c. May be used within partition walls.
    d. Shall be UL listed.
13. Grounding:
    a. Ground all signal and communications cables, panels and equipment.
    b. Ground cabling and conduit at the panel terminations.
    c. Avoid grounding loops.

B. Class 2 Wiring (24 VAC or less):
   1. Conduit is not required for Class 2 wiring in concealed accessible locations.
   2. Support Class 2 wiring not in conduit every 5’ from the building structure, utilizing metal hangers designed for the application.
   3. Install all wiring parallel to the building structural lines.
   4. Install all wiring in accordance with local code requirements.
   5. Class 2 signal wiring and 24VAC power can be run in the same conduit.
   6. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.

C. Line Voltage Power Source:
   1. Take 120-volt AC circuits, used for the Facility Management System, from panelboards and circuit breakers provided by Division 27.
   2. Provide 120-volt AC power to any control panels not shown on drawings.
   3. Circuits used for the FMS shall be dedicated to the FMS and shall not be used for any other purposes.

D. Panels:
   1. Mount panels on wall or floors and support from Unistrut (12 gauge steel metal framing channel).
   2. Mount panels with a minimum of 3' clearance in front of panel.
   3. Mount exposed panels with top of panel at 6' AFF and bottom of panel no lower then 1' AFF.
   4. Mount concealed panels to maintain accessibility for servicing.
   5. Do not mount panels on ductwork.
   6. Panels mounted on units at factory are acceptable.

E. Penetrations:

1. Firestop all penetrations used by FMS. All other project firestopping to be performed by other trades.
2. Close all openings in fire proofed or fire stopped components with approved fire resistive sealant.
3. Wiring passing through penetrations, including walls, shall be in conduit or enclosed raceway.
4. Penetrate floor slabs by core drilling. Penetrations shall be plumb, true, and square.
5. Make no penetrations in structural elements before receiving written approval from architect.

F. FMS Identification Standards:
1. Node Identification:
   a. Identify all Controllers with a permanent label fastened to outside of enclosure.
   b. Labels shall be suitable for the node location.
2. Label cable at the termination points, at a minimum.
3. Label cable at a minimum of every 18" with the FMS manufacturer's name and the type of signal carried within the cable, i.e. Analog Input, Analog Output, Binary Input, Binary Output, and 24 VAC.
4. Each signal type shall be a different color.
5. If there is a building standard color coding, use the building standard. If no color coding scheme exists, the recommended color coding is as follows:

| Cable Description | Color |
|---|---|
| Analog Input | Yellow |
| Analog Output | Tan |
| Binary Input | Orange |
| Binary Output | Violet |
| 24 VAC (Class 2) | Gray |
| General Purpose | Natural |
| Tier 1 Communications | Purple |
| Other Tier Communications | Blue |

6. Raceway Identification: Paint all covers to junction and pull boxes of FMS raceways with the appropriate color.
7. Wire Identification:
   a. Identify all low and line voltage FMS wiring with a number at each end of conductor or cable.
   b. Reference number to associated shop drawing and as-built drawing.
   c. Secure identification number to the conductor or cable and shall be typed.

## 3.4 INPUT DEVICES

A. Installed per the manufacturer recommendation.
B. Locate in accessible locations wherever possible.
C. Locate in accessible local control panels wherever possible.
D. Install as required to meet control sequences.
E. Coordinate all wall mounted device locations with the architectural interior elevations. In instances where the device locations differ between the architectural interior elevations and the HVAC plans consult with the Engineer for direction.
F. Input Flow Measuring Devices: Install in accordance with ASME guidelines affecting non-standard approach conditions.
G. Binary Air Flow Sensors: Install with static pressure tips, tubing, fittings, and air filter.

H. Air Flow Differential Pressure Sensors:
   1. Install with static pressure tips, tubing, fittings, and air filter.
   2. Where pressure sensors are installed within either temperature control panels or where pressure sensors are not installed at the static sensing location provide one of the following:
      a. Run all poly tubing from the static pressure sensor to the static sensing location.
      b. Provide copper tubing from the static pressure sensor to the static sensing location.
I. Resettable Air Flow Differential Pressure Sensors:
   1. Install with static pressure tips, tubing, fittings, and air filter.
   2. Where pressure sensors are installed within either temperature control panels or where pressure sensors are not installed at the static sensing location provide one of the following:
      a. Run all poly tubing from the static pressure sensor to the static sensing location.
      b. Provide copper tubing from the static pressure sensor to the static sensing location.
J. Building Differential Pressure:
   1. Install exterior sensing tip with shielded static air probe.
   2. The interior tip shall be inconspicuous and located as shown on the drawings.
K. Current Sensors:
   1. Mount sensors per manufacturers instructions.
   2. Position sensors for ease of repair and/or replacement.
   3. Sensors shall be insertion type, constructed as a complete assembly with lock nut and mounting plate.
   4. Mount to suitable supports using factory approved holders.
L. Damper Position Sensors:
   1. Mount sensors in an electrical box through a hole in the duct.
   2. Position sensors for ease of repair and/or replacement.
   3. Sensors shall be insertion type, constructed as a complete assembly with lock nut and mounting plate.
   4. Mount to suitable supports using factory approved holders.
M. Duct Relative Humidity Sensors:
   1. Mount sensors in an electrical box through a hole in the duct.
   2. Position sensors for ease of repair and/or replacement.
   3. Sensors shall be insertion type, constructed as a complete assembly with lock nut and mounting plate.
   4. Mount to suitable supports using factory approved holders.
N. Duct Temperature Sensors:
   1. Mount sensors in an electrical box through a hole in the duct.
   2. Sensors shall be insertion type, constructed as a complete assembly with lock nut and mounting plate.
   3. Provide an averaging sensor for ductwork greater in any dimension than 48 inches or where air temperature stratification exists.
   4. Mount to suitable supports using factory approved holders.
O. Low Temperature Limit Switches:
   1. Install on the discharge side of the first water or steam coil in the air stream.
   2. Mount element horizontally across duct in a serpentine pattern ensuring each square foot of coil is protected by 1 foot of sensor.
   3. Provide additional switches where sensing element does not provide full coverage of the air stream.
P. Outside Air Sensors: Mount sensors on the North wall or in a continuous outside air intake.

Q. Space Thermostats:
   1. Mount per ADA requirements.
   2. Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.
   3. Align horizontally with light switches and other devices by other contractors.
   4. Do not install within 2' of the inside corner of adjacent walls.
   5. Do not install above heat sources.
R. Space Temperature and/or Humidity Sensors:
   1. Mount at an elevation above light switches. Coordinate exact mounting height with the architectural plans and Owner requirements.
   2. Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.
   3. Align vertically with light switches and other devices by other contractors.
   4. Do not install within 2' of the inside corner of adjacent walls.
   5. Do not install above heat sources.
S. Static Pressure Sensors:
   1. Install with static pressure tips, tubing, fittings, and air filter.
   2. Where pressure sensors are installed within either temperature control panels or where pressure sensors are not installed at the static sensing location provide one of the following:
      a. Run all poly tubing from the static pressure sensor to the static sensing location.
      b. Provide copper tubing from the static pressure sensor to the static sensing location.
T. Electrical Power Monitoring:
   1. Coordinate work with Electrical Contractor.
U. Gas Detection:
   1. Mount transmitter 5'-0" above finished floor or as required by manufacturer.
   2. Devices shall be readable/adjustable from the ground and not require the use of a ladder to view or adjust.

## 3.5 OUTPUT DEVICES

A. Install per the manufacturer's recommendations.

## 3.6 CONTROLLED DEVICES

A. Install per the manufacturer's recommendations.
B. Electronic Signal Isolation Transducers:
   1. Provide when analog output signal from FMS is connected to an external control system as an input (such as an equipment control panel).
   2. Provide when FMS receives an input as a signal from a remote system.
   3. Provide ground plane and optical isolation between systems.
C. Mechanical contractor shall install all in-line devices such as dampers.
D. Actuators:
   1. Size to close against the maximum system shut-off pressure.
   2. Size to meet torque requirements of device served.
   3. Size to modulate in a smooth fashion through entire stroke.
   4. Floating control is not acceptable.
   5. Provide spring return as indicated below:

| Controlled Device | Location | Service | Spring Return |
|---|---|---|---|
| Damper | AHU/Duct | Supply Air | Yes |
| Damper | AHU/Duct | Return Air | Yes |

E. Control Dampers:
   1. Provide opposed blade for modulating control of airflow.
   2. Provide parallel blade for two position applications.
   3. Use the following dampers for the following applications:

| Service | Damper Type | Duct Velocity (FPM) | Duct Static Pressure (“ W.C.) | AMCA Leakage Rating |
|---|---|---|---|---|
| Supply Air | Airfoil | All. | All. | Class I |
| Return Air | Airfoil | All. | All. | Class I |
| | | | | |

## 3.7 TRAINING

A. FMS contractor shall provide the following training services:
   1. On-Site Orientation:
      a. Provide [one day] of orientation by a field engineer who is fully knowledgeable of the specific installation details of the project.
      b. Minimum Requirements: Review project as-built drawings, FMS software layout and naming conventions, and walk-through facility to identify panel and device locations.

## 3.8 COMMISSIONING

A. Commission all control systems detailed in this Specification, the Control Sequences, and the Points Chart.
B. Commissioning shall include the following:
   1. Verify proper installation practices by the FMS Contractor and subcontractors.
   2. Point verification and calibration.
   3. System/sequence of operation verification with respect to specified operation, and network/workstation verification.
   4. Present documentation to Engineer upon completion of each commissioning step and final completion to ensure proper operation of the FMS.
   5. Acceptance Check List:
      a. Document compliance with each item of this Specification.
      b. Complete the check list for all items and functions of the FMS.
      c. Initial each entry with time/date as record of having fully calibrated and tested the FMS.
      d. Submit to Engineer.
      e. Engineer will use acceptance check list as the basis for acceptance testing with the FMS Contractor.
   6. Testing Procedure (upon completion of installation):
      a. Start-up the system and perform diagnostic testing to ensure proper operation.
      b. Generate all software and enter all database information to perform the sequences of control specified.
   7. Testing Documentation (prior to acceptance testing):
      a. Create input and output points on an individual system basis.
   8. Field Points Testing:
      a. Verify all installed points receive or transmit the correct information prior to loading/activating the system software.
      b. Binary Inputs: Test using one of the following:
         1). HAND/OFF/AUTOMATIC selector switch on the associated motor

control center.
2). Jumper across the field device contacts.
c. Binary Outputs: Perform ON/OFF commands from the workstation to verify each point.
d. Analog Outputs: Send a command from the OWS to modulate the output device from minimum calibrated signal to maximum calibrated output.
e. Analog Inputs: Compare reading obtained through OWS or portable OWS to the value of an independent testing meter.

9. Provide all necessary specialist labor, materials and tools to demonstrate to the Engineer that the FMS has been commissioned and is operating in compliance with the contract.
10. Prepare a list of noted deficiencies signed by both Engineer and FMS Contractor.
11. Promptly rectify all listed deficiencies and submit to Engineer completion report.
12. The Engineer may, at their option, choose to witness a retest of the deficiencies in conjunction with the FMS Contractor.
13. Remove or replace, at FMS contractor expense, all items not in compliance with Specification requirements.

## 3.9 FMS SPECIFIC REQUIREMENTS

A. FMS Reports:
1. Provide the following reports, at minimum:
a. Alarm.
b. Off Line.
c. Run Time Summaries.

B. Color Graphic Displays:
1. Required Graphic Displays:

| TYPE | SYSTEM | NOTES |
|---|---|---|
| Navigational | N/A | |
| System | AHU | |
| Floor Plan | VRF | |

2. System Flow Diagrams: Provide for each system with all points indicated.
3. Floor Plan:
a. Provide color graphic for each floor in the facility.
b. Indicate each HVAC zone.
c. Color code to indicate zone values and status.
4. User shall access Color Graphic Displays via a graphical penetration scheme and/or menu selection.

C. Alarms:
1. Program alarms for each system or sub-system in the FMS based on information provided by Owner's staff. Program the following alarms and alarm parameters, at a minimum (based on the requirements of the Point List and the Control Sequence):
a. High Temperature.
b. Low Temperature.
c. High Humidity.
d. Low Humidity.
e. Low Limit Shutdown.
f. Fire/Smoke Shutdown.

D. Schedules:
1. Program schedules for each system or sub-system in the FMS based on information provided by Owner's staff. Program the following schedules at a minimum:
a. Weekly schedules.

b. Monthly schedules.

E. Historical trending and data collection: Program all trend and point history data storage for all FMS points and values as directed by Points List and Control Sequence.

F. Internet/Intranet Browser: Provide a multi-user color graphics and textual interface to allow building staff to access the FMS data via the Internet or Intranet.

G. Annunciation:

1. Provide the following means of automatic personnel annunciation for user-defined FMS events:
   a. Paging.
   b. Text messaging.
   c. Email.

END OF SECTION

# SECTION 23 09 93 - SEQUENCE OF OPERATION

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Sequence of operation.

### 1.2 SYSTEM DESCRIPTION

A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

### 1.3 SUBMITTALS

A. Refer to Section 23 09 00 for required submittals.

### 1.4 CONTRACT CLOSEOUT SUBMITTAL

A. Refer to Section 23 09 00 for required submittals.

### 1.5 DESIGN REQUIREMENTS

A. Provide control and actuation type for the listed equipment as follows:

| EQUIPMENT | CONTROL | DAMPER & VALVE ACTUATION |
|---|---|---|
| DH-1 | DDC | Electric |
| EX RTU-4 | DDC | Electric |
| | | |

## PART 2 PRODUCTS

Not used.

## PART 3 EXECUTION

### 3.1 CONTROL SEQUENCES

A. Setpoints:
1. All setpoints indicated in the control specification are to be adjustable.
2. The setpoints shall be readily available to be modified in the mechanical system software system summary (either textual or graphic based) and under the same software level as hardware points. Some less used setpoints may be provided on a lower software level, if requested by the user Agency for clarity.
3. The setpoints indicated herein are only specified as a calculated starting point (or initial system operation).
4. It is expected that setpoint adjustments and control loop tuning shall be required to provide optimum system operation based on requirements of the building.

5. The following setpoints should be used as initial setpoints unless otherwise specified in the individual control sequences:
   a. Occupied Space Terminal Unit Heating: 72°F
   b. Occupied Space Terminal Unit Cooling: 75°F
   c. Mechanical or Unoccupied Space Ventilation: 78°F
   d. Mechanical or Unoccupied Space Heating: 68°F
6. The control contractor shall work with the balancing contractor and the Engineer to provide the final system setpoint adjustments and control loop tuning after the system is in operation and building is in use.

B. Anti-cycling:
1. When HVAC equipment or a sequence is specified to be started and stopped by a temperature, humidity, pressure setpoint or any other controlled variable, there shall be an adjustable differential setpoint that shall be set to prevent short cycling of the systems and equipment due to minor changes in the controlled variable.
2. Temperature differential setpoints shall be set at 2°F and non-temperature setpoints shall be set at 10% of the controlled range unless otherwise specified.
3. Setpoints shall indicate at when the process should be turned on.
4. Cooling differentials shall be set for below setpoint and heating differentials shall be set above setpoint and will be used to turn the process off.
5. Non-temperature differentials shall be set above setpoint if the setpoint is indicating a minimum value or below setpoint if the setpoint is indicating a maximum value.
6. Provide minimum runtime timers for loads that are cycled to prevent over-cycling.
7. Timers shall be set as specified or as needed to prevent damage or excessive wear to the equipment.
8. Unless otherwise specified in the individual control sequences, fans and pumps shall have a minimum runtime on timers of 15 minutes (adjustable) and off timers of 5 minutes (adjustable).
9. Safeties shall override runtime timers.

C. Deadbands:
1. Provide deadbands for all DDC control loops to prevent constant hunting of output signals to controlled devices.
2. Deadbands shall be set to provide adequate control around setpoint as follows unless otherwise specified in the individual control sequences:
   a. Temperature Control: ±0.5°F.
   b. Humidity Control: ±1% RH.
   c. Airflow Control: ±2% of total flow.
   d. AHU Static Pressure Control: ±0.01 in. w.c.

D. Controls: Hardwire all sensors directly to the BAS controller providing the control signal to the end device. Sharing the input/output signals via a network is not allowed for control.

E. Alarms:
1. Provide all alarmed points with adjustable time delays to prevent nuisance tripping under normal operation and on equipment start-up.
2. Provide alarms on all points as indicated on point charts.

F. Equipment Start/Stop Failure States:
1. All start/stop points for equipment shall utilize normally open contacts unless called out specifically in the individual control sequences.

G. VFD Bypass & Safety Interlocks:
1. VFD's equipped with bypass starters shall be interlocked so that the start/stop and safety circuits that are called out for VFD operation shall be functional when the VFD is indexed to the bypass starter mode.
2. Unless otherwise specified in the sequence below, the switch from inverter to bypass starter modes shall be through a manual switch provided on the VFD/bypass starter package.

H. VFD Minimum Speed:
   1. The VFD start-up technician shall work with the Temperature Controls Contractor determine the minimum speed required for the motor controlled by the VFD to provide cooling of the motor as installed to prevent heat related problems.
   2. This minimum speed shall be set in the VFD controller.
I. Current Switch Setup:
   1. When current switches are used for proving fan or pump status, they shall be set up so that they will detect belt or coupling loss by the reduction in current draw on loss of coupled load.
   2. The current switch set up shall be redone by the 23 09 90 contractor after the balancer is complete.
J. Damper Interlocks for Fans with Starters:
   1. For fan systems with magnetic starters and shutoff dampers specified with end switches, the damper interlock shall be hardwired in such a way that the damper shall open if the fan starter hand/off/auto switch is in the hand or in the auto position and being called to start.
   2. After the damper end switch has proven the damper open, a hardwire interlock from the end switch to the starter holding coil for the fan shall cause the fan to start.
   3. For fan systems that are ducted in parallel, see specific sequence for fan system on interlock requirements.
K. Damper Interlocks for Fans with VFD's:
   1. For fan systems with VFD's and shutoff dampers specified with end switches, the damper end switches shall be hardwire interlocked to the safety circuit(s) of the VFD to prevent the fan from starting until the damper is proven open.
   2. This interlock shall prevent the fan from running in either the VFD or bypass (if provided) mode.
   3. For fan systems that are ducted in parallel, see specific sequence for fan system on interlock requirements.
L. Fan Interlocking:
   1. Provide interlocks between supply and return or exhaust fan systems as scheduled on the plans or called out in individual control sequences.
   2. If DDC controlled, interlocks shall be done through DDC start/stop points unless otherwise specified in individual control sequences.
   3. If not DDC controlled, interlocks shall be accomplished via hardwire interlocks between fan starters or VFD's.
M. Thermostats and Sensors:
   1. All devices and equipment including terminal units, specified to be controlled in a control sequence by a thermostat or sensor, shall be provided with a thermostat or sensor, whether or not the device is indicated on the plans.
   2. Consult the HVAC design engineer for the thermostat or sensor location.
   3. Display Resolution:
      a. Display the following resolutions when indicating measured values:
         1). Airflow: Round up to the nearest full CFM, ie. 102 CFM.
         2). Temperature, Humidity, Current, CO or Similar: Round up to the nearest one-tenth of the unit, ie. 54.2°F.
      b. Use the significant digits indicated above and further discussed with the engineer for building trend data. Do not save trend data with more than the agreed upon resolution.
N. Pressure Sensors:
   1. Pressure sensors used to vary VFD speeds shall be hardwired to the BAS controller providing the control signal to the VFD.
   2. Sharing pressure control signals via a network is not allowed.
   3. Pressure differential control setpoints shall be minimum pressure required to achieve system design airflow. Final setpoint shall be optimized through coordination with the Balancing Contractor.

O. Scheduling:
   1. Provide scheduling of DDC terminal units in groups based on occupancy.
   2. Work with the Owner to determine how many groups are required and which zones should be included.
   3. Individual terminal units shall be able to receive temporary schedules that will override the group schedules.
   4. Temporary override buttons at the zone sensor (where specified on point charts) shall override the scheduling to occupied.

## 3.2 SMOKE DETECTION SYSTEMS

A. Division 28 will provide all smoke detection for the project using one or more of the following methods. Coordinate with Division 28 regarding application use of each type of smoke detector.
   1. Air Handling Unit smoke detection.
   2. Duct mounted smoke detection.
   3. Space smoke detection.
B. Division 28 will provide fire alarm control modules located within 3 feet of the local temperature control panels serving the above equipment.
   1. Division 28 shall open the contacts in the fire alarm control relays whenever there is any fire alarm condition in the building, and close the contacts during normal conditions.
   2. The temperature control contractor shall provide shutdown, using hard wiring in conduit, from the fire alarm control relays to automatically turn off respective air handling systems whenever there is a fire alarm condition.

## 3.3 DESICCANT DEHUMIDIFICATION UNIT (DH-1)

A. Factory Provided DDC Controls:
   1. The Basis of Design unit (pre-purchased by Owner) shall consist of factory installed and factory provided controllers, end-devices, sub-routine panels and safeties, along with a field provided programmable DDC controller.
   2. Temperature Control Contractor shall furnish and install all other devices not provided by basis of design unit factory provided controls that includes but is not limited to: temperature sensors, static pressure sensors, relays, freeze stats, etc.
B. Unit serves the Tosa Room (ice house area) during conditions when ice is in operation.
C. Unit consists of the following:
   1. Mixing Box.
   2. Outside air inlet hood (shipped loose – field installed).
   3. Modulating outside air damper.
   4. Modulating return air damper.
   5. Filter Rack / Pre-filters.
   6. Desiccant Dehumidifier.
   7. Gas Reactivation.
   8. Reactivation filters.
   9. Direct-Drive Reactivation Fan.
   10. Direct drive Supply Fan with unit provided variable frequency drive (VFD). VFD used for balancing only, not direct fan control.
   11. Discharge Plenum.
   12. Indirect-Fired Gas Duct Heater for post heat (to be mounted in supply duct).
D. Damper actuators for the following provided by unit manufacturer:
   1. Outside/Return air damper.
E. Options and Controls (Provided by unit MFR):
   1. Temperature and Dew Point Controls: DDC with BACnet MS/TP Communication Card.

2. User Interface / Annunciator Panel (Unit Mounted).
   a. Flame Failure, Fault and rotation Fault Indication.
   b. Reactivation Energy Rate Bar Graph.
   c. Process Air Flow and Fan On Indication.
   d. Reactivation Air Flow and Fan On Indication.
   e. Call for Dehumidification Indication.
   f. Low Temperature Reactivation Indication.
   g. Filter Differential Pressure Transmitter.
   h. DDC Temperature and Humidity Controls.
3. NEMA 4 ABS Remote User Interface (Shipped loose – Installed by T.C.C.)
4. Space Temperature and Dew Point Transmitter. (Shipped loose – Installed by T.C.C.)
5. Purge Mode Push Button Remote Station (Shipped loose – Installed by T.C.C.)
6. Discharge Air Temperature sensor RTD.
7. Post Heat Entering Air Temperature RTD
8. Space CO2 detector. (Shipped loose, field mounted and wired by T.C.C.)
9. Space CO detector. (Shipped loose, field mounted and wired by T.C.C.)
10. Space NO detector. (Shipped loose, field mounted and wired by T.C.C.)

C. Return and Supply Smoke Duct Detectors (See 3.2 Smoke detection Systems above)

F. System start/stop:
1. Index unit from occupied to unoccupied through the FMS.
2. With the correct power supplied to the unit and the Main Disconnect Switch in the ON position and with the Manual-Off-Auto selector switch in the OFF position, the DDC Controller is powered and the sensors are activated. The unit is in standby. Outside air damper is closed and return air damper fully open.
3. With the Manual-Off-Auto selector switch in the Manual or Auto position and with all safety circuits normal, one of the following airflow modes may be selected.
   a. Unoccupied: With "Unoccupied" ventilation mode selected, and safety circuits normal; supply fan, reactivation process and post heating are energized as required to maintain temperature and humidity set-point. Outside air damper is fully closed and return damper is fully open.
   b. Low Occupancy: With "Low Occupancy" ventilation mode selected, and safety circuits normal; supply fan operates continuously, outside air damper drives 20% (adjustable) open and return damper drives to 80% (adjustable) open. On a call for dehumidification, reactivation fan, desiccant rotor drive and reactivation burner are energized as required to maintain desired humidity level. Post heating is utilized as needed to maintain desired temperature set-point.
   c. Intermittent IAQ: With any ventilation mode selected, except Off, and safety circuits normal, when the set points of any of the indoor air quality sensors are exceeded the supply fan operates continuously, outside air damper drives 100% open and return damper drives fully closed. On a call for dehumidification, reactivation fan, desiccant rotor drive and reactivation burner are energized as required to attempt maintain desired humidity level. Post heating is utilized as needed to maintain desired temperature set-point.
   d. Purge Mode: With any ventilation mode selected, except Off, and safety circuits normal, momentary closure of the “Purge Mode” contact; supply fan operates continuously, outside air damper drives 100% open and return damper drives fully closed for a predetermined time of 10 minutes (adjustable). On a call for dehumidification, reactivation fan, desiccant rotor drive and reactivation burner are energized as required to attempt maintain desired humidity level. Post heating is utilized as needed to maintain desired temperature set-point.

4. Humidity Set-point is adjusted via controller keypad, remote user interface or BACnet communication.
    a. The space dew point is controlled via the DDC Controller. The space dew point is sensed by the space temp/dew point transmitter. When the sensed dew point exceeds the set-point by 2° (adjustable) the DDC controller enables a call for dehumidification energizing the reactivation circuit, including reactivation fan, DH rotor, and reactivation burner.
5. Reactivation Control: Reactivation burner ignition and flame management on gas fired units are controlled via a dedicated flame safeguard system and proven via flame rectification. Pre-ignition interlocks include react airflow differential pressure proving switch and manual reset high temperature limit switch.
6. Reactivation burner firing rate is controlled via microprocessor controller as follows:
    a. ROT Control: As moisture load changes, desiccant ROT (Reactivation Outlet Temperature) is maintained. Naturally, as the moisture load increases the heater will increase modulation and as the moisture load decreases, the heater will decrease modulation. The RIT (Reactivation Inlet Temperature) will be limited.
    b. Fail-Safe Mode: In order to preserve limited performance, in the event of a sensor failure, the DDC controller will deliver energy rate as follows:
        1) With failed RIT or ROT sensor, heater output signal is set to a maximum of 50%.
7. Unit Alarms:
    a. Alarms will occur with each fault and will be displayed on the DDC controller user interface and available to the BMS.
        1) Reactivation Low Temp Fault: Occurs when the ROT fails to achieve or falls below 90°F over a 15 minute period. The unit will continue to run.
        2) Desiccant Rotor Rotation Fault: Occurs when rotation is not detected within the programmed time. Reactivation process is disabled. The unit will continue to run.
        3) External Faults: Other customer or factory provided devices may be installed to initiate unit shutdown via “External Faults” input. Unit shutdown occurs upon closing of customer contacts or installed factory contacts.
        4) Reactivation Flame Safety Fault: Occurs when flame failure is detected by the flame safeguard relay. Reactivation process is disabled. The unit will continue to run.
        5) RIT Over Temp Fault (Manual Reset): Occurs when RIT exceeds 400°F. Reactivation process is disabled. The unit will continue to run. To reset the High Limit Stat, cycle unit power.
        6) RIT Over Temp Fault (Programmed): Occurs when the RIT senses a temperature greater than 360°F. Reactivation process is disabled. The unit will continue to run.
        7) ROT Over Temp Fault (Programmed): Occurs when the ROT senses a temperature greater than 200°F. Reactivation process is disabled. The unit will continue to run.
        8) Reactivation Airflow Restriction Fault: Occurs when RIT exceeds 325°F and the react energy modulation is at 0%. Reactivation process is disabled. The unit will continue to run.
        9) Supply Air Flow Fault: Occurs when airflow is not sensed within 120 seconds of the run command or loss of air flow during operation. The unit will shut down.

10) Reactivation Air Flow Fault: Occurs when airflow is not sensed within 60 seconds of the react enable command or loss of air flow during operation. React is disabled. The supply fan will continue to run.
11) DAT (discharge air temperature) Low Limit Fault: Occurs 10 minutes (adjustable) after a failure to achieve DAT above the low limit set point. The unit will shut down.
12) Post Heater #1 Fault: Occurs when the post heater experiences burner ignition failure. The supply fan will continue to run.
13) Post Heater #2 Fault: Occurs when the post heater experiences burner ignition failure. The supply fan will continue to run.
14) React Air Flow Fault, DF React Gas Pressure Caused (Manual Reset): Occurs 60 seconds after the high/low gas pressure switch exceeds the switch setting. The unit will continue to run.

a. After corrective action is taken, the DDC controller fault condition(s) may be reset via:
1) DDC controller user interface.
2) Cycling of the “Manual-Off-Auto” selector switch to the OFF position.
3) Cycling main unit power.
4) Remote user interface.
5) BMS interface

8. Space Temperature Control:
a. The space temperature is measured by the space temp/dew point transmitter. The DDC controller will control the post heating as needed to maintain the space temperature set-point (adjustable).
b. Post Heating:
1) When the space temperature falls below the set-point by 1° (Adj PB) the DDC controller enables the first stage of heating. If the space temperature remains lower than set-point by 1° for the duration of the interstage time delay, the second stage of heat is energized. This process is repeated for the remaining stages.
2) The interstage timer for staging is to eliminate short cycling. The timer is adjustable and initially set to 5 minutes.
3) To prevent discharging high temps the number of stages allowed will be limited based on the heater entering air temperature.
4) When the space temp has increased above set-point by approximately 1° and the interstage timer has elapsed, the last stage on will stage off. This will continue until all stages are off.
5) To prevent discharging low temps from the unit, the 1st stage will be enabled if the post heat EAT is below 35°F (adjustable) set point. Additional stages are enabled for each additional 20° the heater EAT is below set point.

G. Smoke Shutdown:
1. Provide hardwired interlock to the fire alarm module provided by the Electrical Contractor.
2. Upon a fire alarm, the air handling unit shall be shut down.
3. System shall return to its normal mode upon fire alarm reset.

H. Filter Differential Pressure:
1. A dedicated factory wired differential pressure transmitter is provided across the unit filter bank. Provide interface with BAS to monitor and alarm.

I. Control Panel:
1. All additional field required control components required for control of this system shall be installed in a temperature control panel located as shown on the plans.

J. Unit Isolation Dampers:
1. Furnish motor operated dampers and provide actuators for the following:
a. Supply air duct main (exterior location on roof).
b. Return air duct main (exterior location on roof).

2. Open the supply air and return air isolation dampers whenever the unit is enabled and in operating mode.
3. Provide an end switch at the unit isolation dampers to prevent the fans from starting until the dampers are 100% open.

### 3.04 GAS-FIRED DUCT HEATER (DF-1)

A. Unit serves dehumidification unit DH-1.
B. Unit provided with modulating control, to be controlled by space temperature sensor with discharge air temperature sensor (feedback).
C. Rise in duct temperature above setpoint:
   a. De-energize heater.
D. Drop in duct temperature below setpoint:
   a. Energize heater and modulate to maintain setpoint.
E. In addition to the factory provided air flow switch, provide a software interlock to not allow heat to energize if the respective air source (DH-1) is off.

### 3.5 EXISTING AIR HANDLING UNIT (RTU-4)

A. Unit serves the Tosa Room (ice house) during non-ice conditions.
B. Furnish motor operated dampers and provide actuators for the following:
   1. Supply air duct main (exterior location on roof).
   2. Return air duct main (exterior location on roof).
C. System Start/Stop:
   1. Existing controls to remain in place.
   2. Unit to be indexed on through the BAS.
   3. Open the supply air and return air isolation dampers whenever the unit is enabled and
      in operating mode.
   4. Provide an end switch at the unit isolation dampers to prevent the fans from starting until the dampers are 100% open.

### 3.6 DUCTLESS SPLIT SYSTEM

A. Temperature Sensor: Provided with unit, installed by this contractor.
B. Provide all control field wiring per unit manufacturer's recommendation.
C. Provide interface to unit supplied BACnet card.
   1. All enabled alarms associated with unit shall be displayed at the BAS user interface.
   2. Coordinate with building facilities group on required points to be monitored (Minimum recommended are space temperature, diagnostics and operating mode).

### 3.7 DDC POINT CHARTS/INTEGRATION

A. Furnish, as a minimum, all points indicated on the Point Charts and as necessary for proper system operation.
B. Include work to interface with third party systems.
C. Monitor the gas and power sub-meters and trend on the existing BAS.
D. If there are conflicts between the points list and sequences, the BAS contractor is to include all necessary software, hardware, firmware, operating equipment, devices, and system components required for the systems identified and their sequences described within this Section in order to provide a complete system within the intent of this specification. Provide scope clarifications with their bids if there are any such conflicts.

END OF SECTION

## DDC INPUT/OUTPUT SUMMARY TABLE

**Project: Muellner Building Renovation** | **Project No: 223003.00**

| System/Equipment: Point Name | Units | Hardware Points: AI | AO | BI | BO | Software Points: AV | BV | Schedule | Trend | Alarm | Show on Graphic | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **DH-1** | | | | | | | | | | | | See DH-1 sequences for applicable points |
| Supply Fan S/S | ON/OFF | | | | X | | | | X | X | X | |
| Supply Fan Status | ON/OFF | | | X | | | | | X | X | X | |
| Reactivation Fan S/S | ON/OFF | | | | X | | | | X | X | X | |
| Reactivation Fan Status | ON/OFF | | | X | | | | | X | X | X | |
| Outside Air Damper O/C | Analog | | X | | | | | | X | X | X | |
| Outside Air Damper end switch status | ON/OFF | | | X | | | | | X | X | X | BAS status, plus hard wired interlock |
| Return Air Damper O/C | Analog | | X | | | | | | X | X | X | |
| Return Air Damper end switch status | ON/OFF | | | X | | | | | X | X | X | BAS status, plus hard wired interlock |
| Reativation Gas Valve Enable | ON/OFF | | | | X | | | | X | X | X | |
| Reactivation Gas Valve Variable Capacity | % Open | | | | X | | | | X | X | X | |
| Post Heat Gas Valve Enable | ON/OFF | | | | X | | | | X | X | X | |
| Post Heat Gas Valve Variable Capacity | % Open | | | | X | | | | X | X | X | |
| Desiccant Dehumidifier Process Leaving (supply duct) Temperature | °F | X | | | | | | | X | X | X | |
| Desiccant Dehumidifier Reactivation Leaving (exhaust duct) Temperature | °F | X | | | | | | | X | X | X | |
| Return Air Temperature | °F | X | | | | | | | X | X | X | |
| Return Air Humidity | % RH | X | | | | | | | X | X | X | |
| Discharge Air Temperature | °F | X | | | | | | | X | X | X | |
| Space Tempurature & Dew Point | °F | X | | | | | | | X | X | X | |
| Space Humidity | % RH | X | | | | | | | X | X | X | |
| Filter Differential Pressure Pre-filter(s) React. & Process | " W.C. | X | | | | | | | X | X | X | |
| Fire Alarm | ON/OFF | | | X | | | | | X | X | X | BAS status and hard wired interlock to fans |
| Freeze Alarm | ON/OFF | | | X | | | | | X | X | X | BAS status and hard wired interlock to fans |
| Desiccant Wheel Rotor S/S | ON/OFF | | | | X | | | | X | X | X | |
| Desiccant Wheel Rotor VFD reference | Analog | | X | | | | | | X | X | X | |
| Desiccant Wheel Rotor Status | ON/OFF | | | X | | | | | X | X | X | |
| CO \| CO2 \| NO Sensors (High Limit Alarm) | | X | | | | | | | X | X | X | Integrate at FMS |

*Note: The minimum integrated points listed shall be mapped. Any additional software points that are available and specifically requested by the owner shall be coordinated and mapped by the DDC contractor.*

## DDC INPUT/OUTPUT SUMMARY TABLE

**Project: Muellner Building Renovation** | **Project No: 223003.00**

| System/Equipment: | | Hardware Points | | | | Software Points | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Point Name** | **Units** | **AI** | **AO** | **BI** | **BO** | **AV** | **BV** | **Schedule** | **Trend** | **Alarm** | **Show on Graphic** | **Remarks** |
| | | | | | | | | | | | | |
| **Ductless Split Systems** | | | | | | | | | | | | |
| Supply Fan S/S | ON/OFF | | | | X | | | | X | X | X | |
| Supply Fan Status | ON/OFF | | | X | | | | | X | X | X | |
| Room Air Setpoint | °F | X | | | | | | | X | X | X | |
| Room Air | °F | X | | | | | | | | | X | |
| Programmable Alarm | Analog | X | | | | | | | | X | X | general alarm |
| | | | | | | | | | | | | |
| **Gas-Fired Duct Furnace (DH-1)** | | | | | | | | | | | | |
| Leaving Air Temperature | °F | X | | | | | | | X | X | X | |
| Heat enable (confirm with equipment controls if req) | ON/OFF | | | | X | | | | | | | |
| Gas Heat modulating control | Analog | | X | | | | | | | | | ( 0-10vdc) |
| Space Temperature | °F | X | | | | | | | X | X | X | |
| | | | | | | | | | | | | |
| **Kitchen Gas Detection System** | | | | | | | | | | | | |
| CO monitor | Analog | X | | | | | | | | X | X | Integrate at existing FMS |
| | | | | | | | | | | | | |
| **Outside Air Conditions** | | | | | | | | | | | | Broadcast OA information to devices |
| Outside Air Temperature | | X | | | | | | | X | X | X | |
| Outside Air Humidity | | X | | | | | | | X | X | X | |
| Outside Air Enthalpy | | | | | | X | | | X | X | X | |
| | | | | | | | | | | | | |
| **Utility System Monitoring** | | | | | | | | | | | | |
| Dehumidification Unit DH-1 and Gas-Fired Duct Furnace DF-1 gas | Analog | X | | | | | | | X | | X | Integrate at existing FMS |
| Dehumidification Unit DH-1 power | KW | X | | | | | | | X | | X | Integrate at existing FMS |
| Ice Chiller power | KW | X | | | | | | | X | | X | Integrate at existing FMS |
| PV Solar System Integration | KW | X | | | | | | | X | | X | Integrate at existing FMS |
| | | | | | | | | | | | | |

*Note: The minimum integrated points listed shall be mapped. Any additional software points that are available and specifically requested by the owner shall be coordinated and mapped by the DDC contractor.*

# SECTION 23 11 23 - GAS PIPING AND ACCESSORIES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Pipe and pipe fittings.
B. Valves.
C. Accessories.

### 1.2 REFERENCES

| | | |
|---|---|---|
| A. | ANSI B16.9 - | Wrought Steel Butt Welding Fittings. |
| B. | ANSI B31.1 - | Power Piping. |
| C. | ASTM A53 - | Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless. |
| D. | ASTM A234 - | Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures. |
| E. | ASTM C-33 - | Standard for backfill/bedding material. |
| F. | ASTM D2513 - | Thermoplastic Polyethylene Pipe and Fittings. |
| G. | NFPA 30 - | Flammable and Combustible Liquids Code. |
| H. | NFPA 54 - | National Fuel Gas Code. |
| I. | ANSI B16.3 - | Malleable Iron Threaded Fittings. |
| J. | Comm 10 - | Wisconsin Administrative Code, Flammable and Combustible Liquids. |

### 1.3 SUBMITTALS

A. Product Data: Provide manufacturers catalog data on pipe materials, pipe fittings, valves and accessories.

### 1.4 CONTRACT CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

### 1.5 QUALITY ASSURANCE

A. Order all Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on the size of the pipe, and in accordance with the appropriate ASTM specification.
B. Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the Owner.

### 1.6 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.
B. Construct all piping 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.
C. Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in occupied spaces and ventilation plenum spaces, including plenum ceilings.

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 grade A pipe is specified, ASTM A53 grade B pipe may be substituted at Contractor's option. Where the grade or type is not specified, Contractor may choose from those commercially available.

## PART 2 PRODUCTS

### 2.1 NATURAL GAS PIPING (ABOVE GRADE)

A. Pipe: ASTM A53, Type E or S, standard weight (Schedule 40), black steel.
B. Fittings:
   1. 2" and smaller and pressure less than 5 psig: ANSI B16.3, malleable iron, Class 150, black, threaded.
   2. 2-1/2" and larger or pressure greater than 5 psig: ASTM A234, grade WPB/ANSI B16.9, carbon steel, standard weight, seamless, welded.
   3. Welded fittings may be used for all pipe sizes, regardless of pressure at Contractor's option.

### 2.2 NATURAL GAS PIPING (BELOW GRADE)

A. Manufacturers:
   1. Plexco.
   2. Pepco.
B. ASTM D2513 thermoplastic polyethylene gas pressure pipe with butt-weld or socket-type polyethylene fusion joints and fittings.

### 2.3 NATURAL GAS VALVES

A. Shutoff Valves
   1. UL listed for use as natural gas shutoff.
   2. 2" and smaller:
      a. Manufacturers:
         1). Nibco.
         2). Crane.
         3). Milwaukee.
      b. Ball valve, bronze body, threaded ends, chrome-plated bronze ball, full or conventional port, Teflon seat, blowout-proof stem, two-piece construction, suitable for 150 psig working pressure. U.L. listed for use as natural gas shut-off.
   3. 2-1/2" thru 4":
      a. Manufacturers:
         1). DeZurik.
         2). Rockwell.
         3). Homestead.
      b. Cast iron body, flanged ends, bronze bearings, electroless nickel plated cast iron plug with Hycar resilient plug seal, Buna-N stem seal packing, lever actuator, 175 psi WOG. U.L. listed for use as natural gas shut-off.
   4. 5" and larger:
      a. Manufacturers:
         1). Rockwell.
         2). Homestead.
      b. Cast iron body, flanged ends, lubricated plug, ASTM A-126, Hycar plug facing, SS bearings, and Buna Vee packing.
      c. Totally enclosed hand wheel actuator, 175 psi W.O.G., U.L. listed for use as natural gas shut-off.

B. Pressure regulators:
   1. 2" and smaller:
      a. Manufacturers:
         1). Fisher Series.
         2). Equivalent
      b. Cast iron body, aluminum spring, nitrile diaphragm, threaded ends, 150 psi WOG, -20°F to 150°F.

## PART 3 EXECUTION

### 3.1 GAS PIPING

A. Paint all gas piping exposed outside with two (2) coats rust resistant paint, color tinted, with color as selected by Architect.
B. Welded Pipe Joints:
   1. Make all welded joints by fusion welding in accordance with ASME codes, ANSI B31, and State Codes where applicable.
   2. Electrodes shall be Lincoln, or approved equal, with coating and diameter as recommended by the manufacturer for the types and thickness of work being done.
C. Threaded Pipe Joints:
   1. Use a Teflon based thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.
D. Test gas piping in manner approved by the Gas Utility Company, and conforming to NFPA 54.
E. Pitch horizontal piping down 1" in 60 feet in the direction of flow.
F. Install a 4" minimum depth dirt leg at the bottom of each vertical run and at each appliance.
G. Provide shutoff valve and cap gas tight each tee or pipe end which will not be immediately extended.
H. All branch connections to the main shall be from the top or side of the main.
I. Install a shut-off valve at each appliance.
J. Provide a valved connection at the main for equipment and appliances furnished by others where final connection is by others.
K. Pipe each gas pressure reducing valve vent and relief valve vent separately through the roof to a point outside of the building, terminate with a screened vent cap, locate according to code, and terminate no closer than ten feet of an outside air intake.
L. Install all piping in conformance with NFPA 54, including pipe supports.
M. Gas Meter:
   1. Meter provided by local utility company.
   2. Connect at gas meter outlet per utility company requirements.
   3. Provide a main gas line shutoff valve immediately after the meter connection.
   4. Provide an electrical power source of appropriate voltage at the meter as required.
N. Underground gas piping:
   1. Excavate trench required for gas piping, and remove all excavated material from the job site.
   2. Provide 18" minimum cover unless indicated otherwise.
   3. Provide 6" sand bedding for gas piping and sand backfill to within 6" of finish grade.
   4. Compact backfill in accordance with requirements of Division 2.
   5. All joints in underground polyethylene gas pipe must be by qualified personnel proficient in the joining methods of ASTM D2513 thermoplastic gas pressure pipe and polyethylene fittings.
   6. Provide in trench near top of backfill, underground warning tapes, 4 mil polyethylene, which reads “CAUTION” continuously and notes “Buried Gas “Line Below”. Tape colors shall conform to latest APWA and AASHTO specs.

### 3.2 FINISH GRADE WORK

A. Finish grade restoration, including the final 6" of backfill, seed or sod installation, finish paving or other final surface treatment shall be provided by the General Contractor.

END OF SECTION

# SECTION 23 23 13 - REFRIGERANT PIPING AND SPECIALTIES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Piping.
B. Refrigerant.
C. Moisture indicators.
D. Valves.
E. Filter-driers.
F. Solenoid valves.
G. Expansion valves.

### 1.2 REFERENCES

| | | |
|---|---|---|
| A. | ARI 710 - | Liquid Line Dryers. |
| B. | ARI 730 - | Flow-Capacity Rating and Application of Suction-Line Filters and Filter-Driers |
| C. | ARI 750 - | Thermostatic Refrigerant Expansion Valves. |
| D. | ARI 760 - | Solenoid Valves for Use with Volatile Refrigerants. |
| E. | ASHRAE 15 - | Safety Code for Mechanical Refrigeration. |
| F. | ASHRAE 34 - | Number Designation of Refrigerants. |
| G. | ASME - | Boiler and Pressure Vessel Codes, SEC 9 - Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators. |
| H. | ASME B16.22 - | Wrought Copper and Copper Alloy Solder Joint Pressure Fittings. |
| I. | ASME B16.26 - | Cast Copper Alloy Fittings for Flared Copper Tubes. |
| J. | ASME B31.5 - | Refrigeration Piping. |
| K. | ASME SEC 8D - | Boilers and Pressure Vessels Code, Rules for Construction of Pressure Vessels. |
| L. | ASTM B88 - | Seamless Copper Water Tube. |
| M. | ASTM B280 - | Seamless Copper Tube for Air Conditioning and Refrigeration Field Service. |
| N. | AWS A5.8 - | Brazing Filler Metal. |
| O. | UL 429 - | Electrically Operated Valves. |

### 1.3 SUBMITTALS

A. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
B. Product Data: Provide general assembly of specialties, including manufacturer’s catalogue information. Provide manufacturers catalog data including load capacity.
C. Test Reports: Indicate results of leak test, acid test.
D. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

### 1.4 CONTRACT CLOSEOUT SUBMITTALS

A. Record exact locations of equipment and refrigeration accessories on record drawings.
B. Test Reports: Indicate results of leak test, acid test.
C. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

## 1.5 QUALITY ASSURANCE

A. Conform to ASME B31.5 for installation of piping system.
B. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.
B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

# PART 2 PRODUCTS

## 2.1 PIPING

A. Copper Tubing: ASTM B280, Type ACR hard drawn.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480°F.
B. Copper Tubing to 7/8 inch OD: ASTM B88, Type K, annealed.
   1. Fittings: ASME B16.26 cast copper.
   2. Joints: Flared.

## 2.2 REFRIGERANT

A. Refrigerant: ASHRAE 34.
   1. R-410A.

## 2.3 REFRIGERANT SPECIALTIES

A. Manufacturers:
   1. Sporlan.
   2. Mueller.
   3. Henry.
B. Moisture indicators: Double port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum working pressure of 500 psig and maximum temperature of 200°F.
C. Packed Angle Valves: Forged brass, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psig and maximum temperature of 275°F.
D. Service Valves: Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psig.
E. Filter Dryers:
   1. Replaceable Cartridge Angle Type:
      a. Manufacturers:
      b. Shell: ARI 710, UL listed, steel, removable cap, for maximum working pressure of 500 psig.
      c. Filter/Dryer Cartridge: Pleated media with solid core sieve with activated alumina.

2. Permanent Straight Through Type:
   a. Manufacturers:
   b. ARI 710, UL listed, steel shell with molded desiccant filter core, for maximum working pressure of 500 psig.

F. Solenoid Valves:
1. Valve:
   a. ARI 760, pilot operated, copper or brass body.
   b. Internal parts, synthetic seat, stainless steel stem and plunger assembly, with flared, solder, or threaded ends; for maximum working pressure of 500 psig.
   c. Stem shall permit manual operation in case of coil failure.
2. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture, and fungus proof, with surge protector and color-coded lead wires, integral junction box.

G. Expansion Valves:
1. Angle or Straight Through Type: ARI 750; design suitable for refrigerant, brass body, internal or external equalizer.
2. Bleed hole.
3. Mechanical pressure limit (maximum operating pressure MOP feature).
4. Adjustable super heat setting.
5. Replaceable inlet strainer, with replaceable capillary tube.
6. Remote sensing bulb and remote bulb well.
7. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10°F super heat. Select to avoid being undersized at full load and excessively oversized at part load.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.
B. Remove scale and dirt on inside and outside before assembly.
C. Prepare piping connections to equipment with flanges or unions.

### 3.2 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.
B. Route piping in orderly manner, with piping parallel to building structure, and maintain gradient.
C. Install piping to conserve building space and not interfere with use of space.
D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
G. Provide clearance for installation of insulation and access to valves and fittings.
H. Provide access to concealed valves and fittings.
I. Flood piping system with nitrogen when brazing.
J. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.
K. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
L. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.

M. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
N. Fully charge completed system with refrigerant after testing.
O. Moisture Indicators: Use line size on leaving side of liquid solenoid valves.
P. Valves:
    1. Use service valves on suction and discharge of compressors.
    2. Use gage taps at compressor inlet and outlet.
    3. Use gage taps at hot gas bypass regulators, inlet and outlet.
Q. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver, shut-off valve and expansion valve.
R. Permanent Filter-Driers: Use in each circuit under 20 tons utilizing hermetic compressors.
S. Replaceable Cartridge Filter-Driers: Use in each circuit 20 tons and over.
T. Solenoid Valves:
    1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
    2. Use in liquid line of single or multiple evaporator systems.

## 3.3 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.
B. Pressure test system with dry nitrogen to 200 psig. Perform final tests at 27 inches vacuum and 200 psig using electronic leak detector. Test to no leakage.

END OF SECTION

# SECTION 23 31 00 - DUCTWORK

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Metal ductwork.
B. Nonmetal ductwork.
C. Sealing.
D. Duct cleaning.
E. Leak testing.
F. Hangers and supports.

### 1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

| | | |
|---|---|---|
| A. | Section 11400 - | Food Service Equipment: Kitchen hoods. |
| B. | Section 23 09 00 – | Temperature Controls: Smoke, Fire/Smoke, Motor Operated Dampers, and Air Flow Measuring Stations. |

### 1.3 REFERENCES

| | | |
|---|---|---|
| A. | ASHRAE Handbook - | Equipment. |
| B. | ASTM A 90 - | Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles. |
| C. | ASTM A 525 - | General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process. |
| D. | ASTM A 527 - | Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality. |
| E. | ASTM B209 - | Aluminum and Aluminum-Alloy Sheet and Plate. |
| F. | NFPA 90A - | Installation of Air Conditioning and Ventilating Systems. |
| G. | NFPA 90B - | Installation of Warm Air Heating and Air Conditioning Systems. |
| H. | SMACNA - | HVAC Air Duct Leakage Test Manual. |
| I. | SMACNA - | HVAC Duct Construction Standards - Metal and Flexible. |
| J. | UL 181 - | Factory-Made Air Ducts and Connectors. |
| K. | ASTM A 167 - | Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip. |
| L. | NFPA 45 - | Fire Protection for Laboratories Using Chemicals. |
| M. | NFPA 91 - | Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying. |
| N. | NFPA 96 - | Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment. |
| O. | SMACNA - | Rectangular Industrial Duct Construction Standards. |
| P. | SMACNA - | Round Industrial Duct Construction Standards. |

### 1.4 DESIGN REQUIREMENTS

A. Provide duct material, gauges, and reinforcing for w.c. (water column) operating pressures indicated.

B. Duct systems shall be constructed to the following SMACNA pressure classifications:

| DESCRIPTION | PRESSURE CLASSIFICATION |
|---|---|
| Supply Ductwork | |
| In mechanical rooms and duct shafts | +4” |
| Upstream of VAV (Variable Air Volume) and CV (Constant Volume) boxes | +4” |
| Upstream of reheat coils | +3“ |
| Downstream of VAV and CV boxes and reheat coils | +2” |
| In single zone systems | +3” |
| Outside Air Ductwork | -2” |
| Return Ductwork | |
| In mechanical rooms and duct shafts | -2” |
| Return ductwork on floors | -2” |
| Transfer ductwork | +/-1” |
| Exhaust Ductwork | -2” |
| Relief Ductwork | +2” |
| | |

C. Seal ductwork in accordance with SMACNA HVAC Duct Construction Standards, Table 1-2 as a minimum, and as listed below.

| DESCRIPTION | SEAL CLASS |
|---|---|
| Supply Ductwork | |
| Upstream of VAV and CV boxes and reheat coils | A |
| Downstream of VAV and CV boxes | B |
| Transfer ductwork | B |
| Return Ductwork | B |
| Exhaust Ductwork | B |
| Relief Ductwork | B |
| | |

## 1.5 PERFORMANCE REQUIREMENTS

A. Perform Work in accordance with the latest editions of:
1. SMACNA - HVAC Duct Construction Standards.
2. ASHRAE Handbook - Equipment.
3. SMACNA - Rectangular Industrial Duct Construction Standards.
4. SMACNA - Round Industrial Duct Construction Standards.
5. American Conference of Governmental Industrial Hygienists - Industrial Ventilation, a Manual of Recommended Practice.
6. NFPA 90A, 90B, 95, 45, and 91 standards.
7. SMACNA – Duct Cleanliness for New Construction Standards

## 1.6 SUBMITTALS

A. Submit ductwork schedule indicating duct use and SMACNA pressure classification, and seal class.
B. Submit data for duct liner including thermal conductivity, air friction correction factor, and limitations of temperature and velocity.
C. Submit data for duct hanging and supporting system.

## 1.7 CONTRACT CLOSEOUT SUBMITTALS

A. Record actual locations of ducts and duct fittings; record changes in fitting location and type and indicate additional fittings used.
B. Indicate pressure tests performed which include date, section tested, test pressure, and leakage rate, all in accordance with SMACNA HVAC Air Duct Leakage Test Manual.

# PART 2 PRODUCTS

## 2.1 SHEET METAL

A. Galvanized steel: ASTM A653/A653M of lock forming quality; 1.25 ounce per square foot zinc coating (G90 in accordance with ASTM A90/A90M on both sides of sheet. Minimum Duct Thickness: 25 gauge.
B. Aluminum: ASTM B209, alloy 3003H-14 capable of double seaming without fracture.
C. Stainless steel: ASTM 167, type 304 or 306.
   1. Concealed: No. 2B mill rolled finish.
   2. Exposed: No. 4 ground finish.

## 2.2 LOW PRESSURE DUCTWORK (MAXIMUM 2" PRESSURE CLASS)

A. Material: Galvanized steel sheet with lockseams drawn airtight.
B. Round ducts:
   1. Exposed in finished spaces: Spiral lockseam.
   2. Exposed in mechanical rooms or concealed: Longitudinal or spiral lockseam.

## 2.3 HIGH PRESSURE DUCTWORK (PRESSURE CLASS 3" AND OVER)

A. Material: Galvanized steel sheet with lockseams drawn airtight.
B. Rectangular Duct Connection System:
   1. Manufacturers:
      a. Ductmate 25 or 35.
      b. Nexus.
      c. TDC.
   2. Construction:
      a. Rollformed galvanized steel angle with integral sealant.
      b. Metal corner for insertion into angle.
      c. Metal cleats.
      d. Extruded butyl gasket between mating surfaces.
      e. Bolted corners.
C. Round or Oval Ductwork:
   1. Manufacturers:
      a. United Sheet Metal.
      b. Semco.
      c. Ajax.
   2. Construction: Spiral lockseam.
   3. Fittings and Couplings:
      a. 2 gauges heavier (minimum) than duct.
      b. Continuous welds, or spot welded and bonded with sealant, along all fitting seams as required to meet leakage rate.
      c. All 90° tees and 45° laterals (wyes) shall have a conical entrance into the tap.
      d. Conical tee tap saddles and conical 45° entry tee saddles welded onto spiral duct sections shall be permitted.
   4. Elbows:
      a. Diameters 3" thru 8": Die-stamped.
      b. Elbows 9" and above: Gored construction with all seams continuous welded.

5. Double-walled acoustical ductwork where indicated: Outer shell, 1" insulation and a perforated metal inner liner.
6. Joints:
   a. Duct-to-duct diameters up to 50": Sleeve couplings, reinforced by rolled beads.
   b. Duct-to-fitting diameters up to 50": Slip-fit of projecting collar of the fitting into the pipe.
   c. Duct-to-duct and duct-to-fitting diameters above 50": Angle ring flanges; bolt hole spacing for angle rings shall not exceed 6".
   d. Insertion length: 2" for diameters through 9" and 4" for diameters 10" and above.

## 2.4 FLEXIBLE DUCTWORK

A. Listing:
   1. U.L. 181 listed as a Class 1 flexible air duct.
   2. Comply with NFPA 90A requirements.
   3. Flame spread of 25 or less and smoke developed rating of 50 or less.
B. Manufacturers:
   1. Thermaflex.
   2. Flexmaster.
   3. Approved Equal.
C. Low Pressure Insulated Flexible Ductwork (maximum 2" pressure class):
   1. Core Construction:
      a. Materials:
         1). PVC coated fiberglass reinforced fabric
         2). Trilaminate of aluminum foil, fiberglass, and aluminized polyester.
      b. Mechanically fasten core to a coated steel wire helix. Bonding the core to the steel wire helix is unacceptable.
      c. Core shall maintain its free area and a centerline radius of 1.0 or better.
   2. Insulation:
      a. Flexible fiberglass with a minimum thickness of 1-1/2” and an R value of 6.0 at 75°F.
      b. Provide an insulation overlap of at least 2”.
   3. Outer jacket: Fiberglass reinforced metalized film vapor barrier having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96 procedure A.
   4. Rating: +6" and -1" W.C. pressure and 4,000 fpm.
D. High Pressure Insulated Flexible Ductwork (pressure class 3" and over):
   1. Core Construction:
      a. Materials:
         1). PVC coated fiberglass reinforced fabric
         2). Trilaminate of aluminum foil, fiberglass, and aluminized polyester.
      b. Mechanically fasten core to a coated steel wire helix. Bonding the core to the steel wire helix is unacceptable.
      c. Core shall maintain its free area and a centerline radius of 1.0 or better.
   2. Insulation:
      a. Flexible fiberglass with a minimum thickness of 1-1/2” and an R value of 6.0 at 75°F.
      b. Provide an insulation overlap of at least 2”.
   3. Outer jacket: Fiberglass reinforced metalized film vapor barrier having a permeance of not greater than 0.05 perms when tested in accordance with ASTM E96 procedure A.
   4. Rating: +20" and -10" W.C. pressure and 5,500 fpm.

E. Uninsulated Flexible Ductwork:
   1. Construction: Coated woven fiberglass liner permanently bonded to a coated steel wire helix.
   2. Rating: +10" and -1" W.C. pressure and 5,500 fpm.

## 2.5 ACOUSTIC FLEXIBLE DUCTWORK

A. Manufacturers:
   1. Flexmaster
   2. Thermaflex
   3. Approved Equal.
B. Listing:
   1. U.L. 181 listed as a Class 1 flexible air duct.
   2. Comply with NFPA 90A & 90B requirements.
   3. Flame spread of 25 or less and smoke developed rating of 50 or less.
C. Acoustical insulated flexible ductwork:
   1. Construction:
      a. Inner acoustic liner: Coated woven nylon liner permanently mechanically bonded to a galvanized steel wire helix.
      b. Interior insulation: Fiberglass insulation blanket with inner liner separating insulation from exposure to the air stream.
      c. Outer jacket: Fiberglass reinforced metalized film vapor barrier.
   2. Minimum burst pressure: 2 ½ Times working pressure.
   3. Rating: +6" and -5" W.C. pressure and 5,500 fpm.
   4. Insulation thermal conductance: R-8.0
   5. Acoustical Ratings:
      a. Insertion Losses (in dB) for 6 Feet of straight Acoustic Low-Pressure Flexible aluminum ductwork with liner.

| **Octave Band** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| **HZ** | **125** | **250** | **500** | **1000** | **2000** | **4000** | **8000** | |
| 6” Diameter | 17 | 20 | 20 | 22 | 24 | 21 | - | |
| 8” Diameter | 18 | 17 | 21 | 22 | 25 | 22 | - | |
| 12” Diameter | 16 | 16 | 20 | 20 | 25 | 17 | - | |

      b. Insertion Losses (in dB) for 6 Feet of duct with 90-degree elbow Acoustic Low-Pressure Flexible aluminum ductwork with liner.

| **Octave Band** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **COMMENTS** |
|---|---|---|---|---|---|---|---|---|
| **HZ** | **125** | **250** | **500** | **1000** | **2000** | **4000** | **8000** | |
| 6” Diameter | 21 | 22 | 23 | 25 | 25 | 25 | - | |
| 8” Diameter | 20 | 23 | 25 | 23 | 25 | 26 | - | |
| 12” Diameter | 19 | 20 | 22 | 21 | 22 | 20 | - | |

## 2.6 DUCT LINING

A. Manufacturers:
   1. Knauf.
   2. O.C.
   3. Certainteed.
B. Lining:
   1. Monolithic type of 3.0 lbs./cu.ft. uniform density.
   2. Meet the requirements of ASTM C1071, NFPA 90A and 90B.
   3. Flame spread of 25 or less and smoke developed rating of 50 or less.
   4. Resist water or moisture permanently without chemical breakdown.
   5. No signs of erosion at velocities up to 5,000 FPM.
C. Thickness: 1"
D. Thermal Conductivity: 0.25 BTU/Hr./Sq. Ft./Deg. F./In. at 75°F mean temperature.

E. Air Friction Loss: Shall not exceed 1.2 times the air friction loss for straight galvanized duct at 6000 FPM.

## 2.7 DUCTWORK SEALANTS

A. Sealants shall be water based compounds specifically produced for sealing duct systems.
B. Sealants shall have a maximum flame spread of 25, fuel contributed of 50, and smoke developed of 50.
C. Manufacturers:
   1. Hardcast.
   2. United McGill.
   3. Ductmate.
D. Sealants shall meet requirements of LEED EQc4.1 – Low Emitting Materials: Adhesives and Sealants.
E. Duct sealant tape may be used instead of mastic type sealants if compliant with performance and material specifications.

## 2.8 ADDITIONAL REQUIREMENTS FOR GALVANIZED DUCTWORK EXPOSED IN FINISHED SPACES

A. Fabricate from "paint grip" galvanized steel or similar mill surface etch treatment.
B. Elbows: Standing seam gored or pleated.
C. Sealing: Where required, seal round ductwork by placing a bead of sealer around the inside of the duct before joining sections.
D. Hangers: Provide strap hangers at joints symmetrically spaced.
E. Work shall be free from dents, defects, misalignments and installed level and in a neat manner for exposed applications.

# PART 3 EXECUTION

## 3.1 GENERAL

A. Ductwork shall not be used to support any other services such as conduits, junction boxes, fire protection piping, hangers used for other systems or ceiling support grid.
B. All joints shall be constructed so as to be airtight, smooth inside and true to size as indicated. Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA approved locations if the screw does not extend more than 1/2 inch into the duct.
C. Provide a 2" deep depression at the base of all ducts which penetrate the roof with all joints watertight.
D. Seal all joints for outside air ductwork watertight.
E. Certain vertical and horizontal offsets are indicated (on the drawings) in ducts to indicate the general position relationship of the ductwork systems; provide additional offsets, similar to those indicated, as required to coordinate all ductwork with the installation requirements of other systems, ceilings and structure.
F. Install all ductwork to best suit field conditions and coordinate with the installation work of other trades; the drawings are diagrammatic and shall not be scaled to determine exact location of ductwork.
G. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
H. Install all motor operated, smoke, and combination fire/smoke dampers, airflow measuring stations, and connect to or install equipment furnished by Contractors or the Owner as indicated.
I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

J. All sheet metal work, ductwork systems, etc., shall be installed complete in a manner so as to provide ready for operation of the entire installation herein expressed. Galvanized areas that have been damaged by welding shall be coated with corrosion resistant paint.
K. Duct dimensions indicated on drawings are interior duct dimensions and does not include allowance for applied duct lining, adjust sheet metal sizes where applicable. Factory manufactured dual wall duct dimensions indicated on drawings are interior duct dimensions.
L. Duct sizes shall increase gradually according to the following:
    1. High Pressure Ductwork:
        a. Divergence: Not to exceed 7.5 degrees.
        b. Convergence: Not to exceed 15 degrees.
        c. Only at those specific locations where building construction constraints do not permit the maximum duct size change listed above the following shall apply:
            3). Divergence shall not exceed 15 degrees.
            4). Convergence shall not exceed 30 degrees.
    2. Low Pressure Ductwork:
        d. Divergence: Not to exceed 15 degrees.
        e. Convergence: Not to exceed 15 degrees.
        f. Only at those specific locations where building construction constraints do not permit the maximum duct size change listed above the following shall apply:
            5). Divergence shall not exceed 30 degrees.
            6). Convergence shall not exceed 30 degrees.
M. Elbows, unless specified or indicated otherwise, shall be fabricated with a R/D or R/W relationship of not less than 1.5.
N. Only at those specific locations where building construction constraints do not permit a 1.5 or greater R/D or R/W relationship, the following shall apply:
    1. For return air and exhaust air ductwork, elbows may be fabricated with a R/D or R/W of not less than 1.0. Square or mitered elbows with turning vanes shall not be used.
    2. For supply or outside air ductwork, elbows may be fabricated with a R/D or R/W of not less than 1.0, or may be square elbows fitted with turning vanes.
O. Round ducts may be substituted for rectangular if sized in accordance with ASHRAE Tables of Equivalent Rectangular and Round Ducts.
P. Duct Cleanliness: The mechanical contractor shall conform to all requirements for a Intermediate Cleanliness Level as indicated in SMACNA's Duct Cleanliness for New Construction Guidelines.

## 3.2 LOW PRESSURE DUCTWORK

A. Flange all ducts for attachment to grilles.
B. All joints of outside air ducts shall be sealed watertight with silicone sealant; provide drains in duct where indicated.
C. Paint the inside of all ducts visible through grilles or other outlets with dull black paint.
D. Provide 1/2" wire mesh screen in frame secured to duct over supply, return, and exhaust openings where indicated or required.
E. Install a manual balancing damper in each branch duct for each diffuser or grille.

## 3.3 HIGH PRESSURE DUCTWORK TESTING

A. Method of testing shall be in accordance with the test methods described in SMACNA HVAC Air Duct Leakage Test Manual, Latest Edition.
B. Ductwork shall not be insulated until it has been successfully tested.
C. Test pressure shall be equal to the duct pressure class.
D. If excessive air leakage is found; locate leaks, repair the duct in the area of the leak, seal the duct, and retest.

E. Leakage rate shall not exceed more than 5% of the system air quantity, determined in accordance with Appendix C of the SMACNA HVAC Air Duct Leakage Test Manual. Provide calculations to the engineer proving that the leakage rates achieved for the representative duct sections tested do not exceed the specified 5% leakage rate when applied to entire duct system.
F. The following systems shall be tested:
   1. 25% of each duct system, based on overall duct area, 3” pressure class and greater. Leakage testing shall be performed on representative portions of all duct systems. Leakage testing shall include duct mains, branch ductwork, and run-outs to end devices such as VAV boxes (testing not to be limited to duct mains only). Each duct section tested shall include the following at a minimum:
      a. Five (5) traverse joints.
      b. Typical seams.
      c. Two (1) branch connections.
      d. One (1) elbow.

## 3.4 FLEXIBLE DUCTWORK

A. Connect to ductwork discharge collars, boxes and grilles by sliding core over collar, tape joint with minimum 3 wraps of tape, and apply metal band clamp or panduit. For insulated ductwork, pull insulation and outer jacket back into position, and tape with minimum 3 wraps of tape.
B. Maximum length of flexible ductwork to VAV or CV boxes shall be 5'-0"; maximum length of flexible ductwork to grilles and slots shall be 8'-0".
C. Flexible ductwork shall be supported in at least one location.
D. Flexible ductwork shall not be used to change directions more than 45° upstream of VAV or CV boxes. Change of direction shall be accomplished with sheet metal elbows.
E. Flexible ductwork shall not be run through walls or partitions.
F. Insulated flexible ductwork:
   1. Supply air.
   2. Return air
G. Uninsulated flexible ductwork:
   3. Exhaust air.
H. Acoustic flexible ductwork:
   1. Transfer air.

## 3.5 DUCT LINING

A. Apply lining to the following ductwork:
   2. All return ductwork 25 feet upstream of the return fan.
   3. All transfer ductwork.
B. Application:
   1. Adhere to all interior surfaces of ducts with a 100% minimum coverage of fire retardant adhesive equal to Foster No. 81-60.
   2. Secure with Graham Welding pins or Tuff-Weld nylon hangers on maximum 15" centers at top section (when widths exceed 12" and on sides when height exceeds 14") but not less than one per 2 sq. ft.
   3. Before liner is applied to sheet metal, caulk all edges of acoustical material.
   4. Fasteners shall be flush with linear surface.
   5. Point all joints and seams to eliminate fiber degradation in duct due to air velocities.

## 3.6 DUCTWORK SEALANTS

A. Install per manufacturer's recommendations.
B. Allow sealant to fully cure before pressure testing of ductwork, or before start-up of air handling systems.

## 3.7 DUCT CLEANING

A. Protect ductwork against entry of foreign matter during construction. Provide temporary end caps and seals, or temporary filters over return or exhaust air inlets.
B. Remove all dirt and foreign matter and clean diffusers, registers, and grilles before operating fans.
C. Clean duct systems with high power vacuum machines, and portable air compressor capable of 190 psi.
D. Air compressor shall be used to dislodge dirt from the duct surfaces, and the contaminants shall be drawn to and thru the vacuum machine.
E. Vacuum machines shall be 99.97% HEPA filtered for containment of removed particulate.
F. Protect Owner's equipment and merchandise with polyurethane or drop cloths during the cleaning process.
G. All registers, grilles and diffusers shall be removed, washed and reinstalled.
H. Install critical barriers in the system as required to protect cleaned areas from areas to be cleaned.
I. Any exterior insulated ductwork requiring access shall be neatly cut. After cleaning is complete, patch ductwork and replace insulation to restore to the original condition.
J. All openings made in the system shall be patched with same gauge metal as existing ductwork, screwed into place and sealed with a silicone sealer. Any 1" holes or smaller shall be plugged with airtight cap plugs.
K. Cover all supply diffusers with a special filter material prior to start-up of equipment to protect surroundings. Filter material may be removed after eight (8) hours of operation.
L. Provide the Owner or Owner's representative with suitable access points and the use of a fiber optics borescope, so an inspection of the cleaned surfaces can be made.

## 3.8 SEALING DUCT PENETRATIONS

A. Thru walls where drywall or masonry does not extend to structure: no special requirements.
B. Thru walls where drywall, concrete, or masonry extends to structure:
   1. Fill void between duct and wall with mineral wool.
   2. Non-rated walls: caulk both sides with non-hardening caulk.
   3. Rated walls:
      a. Without Fire, Smoke, or Combination Fire/Smoke Dampers:
         1). Provide an UL approved firestop assembly for the penetration.
         2). Provide a firestop manufacturer’s sticker (Hilti, 3m, etc.) indicating the firestop manufacturer’s UL approved system number for the penetration and all additional information requested on the sticker.
      b. With Fire, Smoke, or Combination Fire/Smoke Dampers: Per the damper manufacturer’s installation requirements.
C. Provide 3-1/2" high concrete curb around all duct openings thru Mechanical Room floors. Provide sheet metal flashing skirt secured to curb and duct. Caulk between skirt and curb with non-hardening caulk.

## 3.9 HANGING AND SUPPORTING SYSTEMS

A. Support rigid ductwork in accordance with methods described in Chapter 4 of SMACNA HVAC Duct Construction Standards, except wire hangers shall not be permitted.
B. Support flexible ductwork in accordance with methods described in Chapter 3 of SMACNA HVAC Duct Construction Standards.
C. Install systems per manufacturers load ratings and application data.

END OF SECTION

# SECTION 23 33 00 - DUCTWORK ACCESSORIES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Turning vanes.
B. Manual volume dampers.
C. Remote control cable operated manual volume dampers.
D. Take-off fittings.
E. Duct access doors.
F. Flexible connections.
G. Backdraft dampers.
H. Fire dampers.
I. Ductwork roof curbs.

### 1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 23 09 00 - Temperature Controls: Smoke, Fire/smoke, motor operated dampers and air flow measuring stations.

### 1.3 REFERENCES

A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
B. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
C. SMACNA - Fire, Smoke, and Radiation Damper Installation Guide for HVAC Systems.
D. UL 33 - Heat Responsive Links for Fire-Protection Service.
E. UL 555 - Fire Dampers and Ceiling Dampers.

### 1.4 SUBMITTALS

A. Submit product data and manufacturer's installation instructions for all ductwork accessories.

### 1.5 CONTRACT CLOSEOUT SUBMITTALS

A. Record actual locations for all ductwork accessories.
B. Fire, Smoke and Fire/Smoke Damper Testing Report.

## PART 2 PRODUCTS

### 2.1 TURNING VANES

A. Manufacturers:
   1. Aero/Dyne Co. H.E.P.
   2. Hart & Cooley.
   3. United McGill.
   4. Semco.
B. Material: Same as ductwork being installed in.
C. Rectangular ductwork:
   1. Construction: Airfoil turning vanes in accordance with SMACNA Fig. 2-3 and 2-4.
   2. Assembly: Installed on side rails on design centers across the full diagonal dimension of the elbow by manufacturer.

3. Vane radius: As provided by Aero/Dyne H.E.P. or 4-1/2 inches with a 3-1/2 inch spacing.
4. Trailing edge extension: Use if duct size changes in an elbow.

D. Round ductwork:
1. Two-piece mitered in accordance with the following:

| Diameter | No. of Vanes |
|---|---|
| 3” thru 9” | 2 |
| 10” thru 14” | 3 |
| 15” thru 19” | 4 |
| 20” thru 60” | 5 |
| Over 60” | 12” maximum spacing |

2. Construction: Minimum 20 gauge.
3. The leading edge of all turning vanes in ducts over 20” diameter shall be hemmed with 1/2” foldback; turning vanes in ducts over 24” diameter shall be reinforced by rods or shall be of sectional construction to limit unsupported lengths to 24”.

## 2.2 MANUAL VOLUME DAMPERS

A. Manufacturers:
1. Ruskin.
2. Vent Products.
3. United McGill.

B. Material: Same as the duct in which it is to be installed.

C. Dampers with extended shafts and quadrants, operator with locking device, and position indicator.

D. Elevated platform for externally insulated ductwork.

E. End bearings or bushings for all volume damper rods penetrating ductwork constructed to a pressure class of 3” W.C. or above.

F. Reinforce blades to prevent vibration, flutter, or other noise.

G. Rectangular Dampers:
1. Ducts which do not exceed 12” high or 36” wide.
   a. Type: Butterfly damper.
   b. Blade: Minimum 22 gauge.
   c. Shaft: Entire length of damper for dampers exceeding 18” in width.
2. Ducts greater than 12” high or 36” wide.
   a. Multi-blade damper with connecting linkage to control from a single point.
   b. Dampers in ductwork in which any dimension exceeds 48” shall be constructed in multiple sections with mullions.
   c. Blades: Minimum 16 gauge with opposed blade action.

H. Round Dampers:
1. Type: Butterfly damper.
2. Blade:
   a. Minimum 20 gauge for use in ductwork less than 3” W.C..
   b. Minimum 14 gauge equivalent thickness for use in ductwork 3” and greater W.C..

## 2.3 REMOTE CONTROL CABLE OPERATED MANUAL VOLUME DAMPERS

A. Manufacturers:
1. Metropolitan Air Technology.
2. Young Regulator.

B. Rectangular Dampers:
1. Construction: 16 gauge galvanized steel.
2. Style: Opposed blade design.

C. Round Dampers:
   1. Construction: 18 gauge galvanized steel.
   2. Style: Radial type.
D. Bearings: Self-lubricated synthetic type.
E. Drive Assemblies: Worm gear.
F. Rotary Cable Lengths: As required to meet project requirements.
G. Rotary Cable Adjustments: Screwdriver tips.
H. Termination Hardware For Cables:
   1. Mounting brackets.
   2. 1” diameter ceiling caps.

## 2.4 TAKE-OFF FITTINGS

A. Manufacturers:
   1. Flexmaster.
   2. United McGill.
B. Provide integral factory installed locking type balancing dampers at all take-off fittings for grilles and slot diffusers.
C. 26 gauge galvanized steel.
D. Conical: 2-piece fitting which has a round connection 2” larger than the outlet.
E. Rectangular to round:
   1. Adhesive coated gasket, 1” integral mounting flange and die formed corner clips.
   2. The depth of the rectangular opening shall be nominally 2 inches less than the diameter of the round outlet.
   3. The overall area of the rectangular inlet shall be nominally 40% greater than the area of the round outlet.
F. Spin-in: One piece.

## 2.5 DUCT ACCESS DOORS

A. Manufacturers:
   1. Cesco.
   2. Flexmaster.
   3. Vent Products.
   4. Kees.
   5. United McGill.
   6. Semco.
B. Material: Same as the duct in which the door is to be installed.
C. Fabrication: Hinge, latches, handles, and rubber gasket in frame.
D. Insulation: Doors in lined or externally insulated ductwork shall be 1” insulated double wall construction.
E. Vision Panels: Provide vision panels with a minimum size 8” x 8” suitable for pressure rating of system.
F. Spin-in units shall have attachment cables.
G. Door shall be suitable for duct static pressure class.
H. Size of door shall be sufficient to perform the intended service with a minimum size of 6” x 6” (8” dia.) up to 24” x 24” (24” dia.). Door size shall not be more than 2” less than the width of the duct if door size is less than 24”x 24” (24” dia.).
I. Round Ductwork:
   1. Smaller than 8” diameter: Removable section of duct.
   2. 8” diameter and larger: 16 gauge rolled sheet metal hinged access door with buckle locks.
J. Ducts Covered with Fire Rated Insulation: Provide pre-fabricated duct access door systems rated for 2000°F supplied by Thermal Ceramics Firemaster or 3M.

## 2.6 FLEXIBLE CONNECTIONS

A. Manufacturers:
   1. Ventfabrics.
   2. Duro-Dyne.
B. Construction: 2-ply material bolted securely to the equipment and connecting ductwork with #16 gauge galvanized iron band (loop) clamps bolted tight to make an airtight connection.
C. Size: Minimum 6” wide.
D. Conventional interior, 200°F maximum, duct systems: Ventglas, 30 oz. per square yard, UL 214 approved.
E. Exterior located, 250°F maximum duct systems: Ventlon, 26 oz. per square yard, UL 214 approved.
F. Interior located, 500°F maximum, duct systems: Ventsil, 16 oz. per square yard, UL 214 approved.
G. Corrosive fume duct system: Ventel, 14 oz. per square yard, coated with teflon resins, 500°F maximum.
H. Induced draft fans and duct systems for temperatures up to 1000°F: Two (2) layers of wire-inserted glass cloth, 50 oz. per square yard and covered on both sides with a layer of Ventglas.

## 2.7 BACKDRAFT DAMPERS

A. Manufacturers:
   1. Ruskin.
   2. Vent Products.
   3. Tampco.
B. Frame and blade construction: Aluminum with blade and edge seals.
C. Leakage: Less than 12 CFM per sq. ft. at 1/2” W.C..
D. Counterbalance to open at approximately 1/8” static pressure.
E. Damper blades linked to act in unison.

## 2.8 FIRE DAMPERS

A. Manufacturers:
   1. Greenheck.
   2. Prefco Products Inc.
   3. Ruskin.
   4. National Controlled Air.
   5. Pottorf.
B. Static Rated Dampers: Not acceptable.
C. Dynamic Rated Dampers:
   1. Curtain style:
      a. Up to 36” x 48”: Style B equivalent low profile (LPB) with streamliner wide blade stack or EGB6 blade out of airstream.
      b. Over 36” x 48”: Not acceptable.
   2. Multi-blade style:
      a. Up to UL approved size limits: 16 gage opposed blade, hat channel frame, stainless steel bearings.
D. Conformance: With the standards of UL, NFPA, and State and Local codes.
E. Ratings:
   1. In accordance with NFPA 90A standard requirements and 92A and B guidelines.
   2. In accordance with UL 555 requirements:
      a. 1-1/2 hour: Openings with a fire resistance rating of 2 hours or less.
      b. 3 hour: Openings with a fire resistance rating of 3 hours or more.
   3. In accordance with UL 555S Class III and IV low leakage requirements.

F. Construction: Very low leakage, non-heat degradable design with friction free metal-to-metal seals incorporated into the blade and frame shapes.
G. Releasing device: Integral re-settable UL 33 listed bi-metal releasing device and center track holding closed assembly activated by duct ambient temperature (165°F setting unless indicated otherwise, e.g. 350°F in smoke control system).
H. Horizontal mounting: Provide with a stainless steel, negator extension spring on a formed or bolted tube shaft.
I. Label: Bear a UL approved label verifying its classification as a dynamic and leakage rated fire damper as required by UL Safety Standards 555, 6th Edition and 555S, 4th Edition.

## 2.9 DUCTWORK ROOF CURBS

A. Manufacturers:
   1. Pate.
   2. Thycurb.
   3. RPS.
B. Construction: 18 gauge galvanized steel, unitized, full mitered corners, all seams welded, 1-1/2" thick rigid fiberglass insulation, wood nailer strip, without raised cant.
C. Compensate for roof insulation and roof pitch for level installation.
D. Height: Minimum 18" above roof insulation.

# PART 3 EXECUTION

## 3.1 INSTALLATION

A. Turning vanes: In elbows where specified in Section 23 31 00, Ductwork.
B. Volume dampers:
   1. Where shown and at the duct take-off for each grille, register, or diffuser as far away from the outlet as possible while still maintaining accessibility to the damper.
   2. Volume dampers integral with grilles shall not replace a volume damper in the take-off.
   3. Expose all damper control arm shafts and actuator arms thru external insulation for the Testing and Balancing Contractor and owner to visually locate dampers.
B. Remote Control Cable Operated Manual Volume Dampers:
   1. Provide remote control cable operated manual volume dampers in all branch ducts located above inaccessible drywall ceilings.
   2. Install in accordance with manufacturers written instructions.
   3. For dampers located more than 20 feet above the finish floor, locate the cable adjustment terminations flush with the floor above rather than in the suspended drywall ceiling below the floor. Where floor grilles are provided, locate the cable adjustment terminations beneath the floor grilles adjacent to the fire damper penetrations. Seal floor penetration with fire-stop sealant.
   4. Omit ceiling access panels at locations where remote control cable operated manual volume dampers are installed.
C. Take-off fittings:
   1. Provide conical take-off fittings for round take-offs from square or rectangular ductwork upstream of variable or constant volume boxes.
   2. Provide rectangular to round take-off fittings instead of conical if duct depth does not permit installation of conical fitting.
   3. Provide spin-in fittings for take-offs to grilles and slot diffusers.
D. Duct Access Doors:
   1. Provide duct access doors at the following locations:
      a. Motor operated and backdraft dampers.
      b. Both sides of duct mounted reheat coils.

c. In return and exhaust ducts at maximum 20 ft. intervals, and at the base of all vertical rises and at square throat elbows with turning vanes.
d. At any device in the duct which requires maintenance, service, cleaning, or inspection.
e. At duct mounted smoke detectors.
f. Upstream of all turning vanes.

2. At all fire dampers, smoke dampers, and smoke detector access doors, door shall be identified with letters, no less than 1-1/2” in height, to indicate the device and its location within.
3. Hinged access doors shall be used where possible. Cam operated removable doors shall be used where space prevents the opening of a hinged model.
4. Provide pre-fabricated accesses door rated for 2000°F in all duct systems covered with fire rated insulation. For grease exhaust ducts, provide duct access doors every 20 feet and at all turn in directions.
5. Access Door Sizing:
   a. Size of door shall be sufficient to perform the intended service.
   b. Minimum Size: 6" x 6" (8" dia.) up to 24" x 24" (24" dia.).
   c. For Ducts Less than or Equal to 26” in Width: Access door size shall be 2" less than the width of the duct.
   d. For Duct Greater than 26” in Width: Access door size shall be 24” x 24” (24” dia.).
   e. Contractor shall install the maximum size access door in ductwork to service equipment based on ductwork size and field conditions. Example:

| DUCTWORK WIDTH | MINIMUM DUCT ACCESS DOOR SIZE |
|---|---|
| 6” | 6/6 |
| 8” | 6/6 |
| 10” | 8/8 |
| 12” | 10/10 |
| 14” | 12/12 |
| 16”- 20” | 14/14 |
| 22”- 24” | 20/20 |
| < 24” | Min. 24/24 |

E. Flexible Connections: Provide at inlet and outlet of all air handling units and fans in accordance with SMACNA Figure 2-19.
F. Fire Dampers:
   1. Dampers shall be installed in accordance with the manufacturer's UL installation instructions, and SMACNA Fire, Smoke, and Radiation Damper Installation Guide for HVAC Systems.
   2. Provide proper size opening in wall or floor construction to accommodate overall size of fire damper.
   3. Where dampers cannot be installed in the rated floor or wall, (i.e., security bars are installed in floor or wall) install a sleeve extension encased in two hour rated fire proofing insulation.
   4. Each fire damper shall be manually tested by removing the fusible link. Repair or replace any fire damper that does not close completely. Reinstall fusible link after test.
   5. Testing Report:
      a. Contractor shall prepare a report indicating all fire dampers have been tested. Report shall be submitted to the Architect/Engineer and owner for review.

b. The report shall include the following information:
   1). List of all dampers, numbered (numbering systems shall be coordinated with owner prior to testing) and keyed to plan identifying locations.
   2). Date damper tested.
   3). Initials of person testing damper.

G. Turn curbs over to the appropriate contractor for installation (turn over point shall be on the roof at point of installation).

H. One hour Rated Rooms:
   1. Install sheet metal ductwork for final connections to terminal devices including grilles to conform to a one hour room rating.

END OF SECTION

# SECTION 23 34 16 - CENTRIFUGAL FANS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. SWSI/DWDI Centrifugal Fans.
B. Bearings and Drives.
C. Fan Accessories.

### 1.2 REFERENCES

| | | |
|---|---|---|
| A. | ABMA 9 - | Load Ratings and Fatigue Life for Ball Bearings. |
| B. | ABMA 11 - | Load Ratings and Fatigue Life for Roller Bearings. |
| C. | AMCA 99 - | Standards Handbook. |
| D. | AMCA 210 - | Laboratory Methods of Testing Fans for Rating Purposes |
| E. | AMCA 300 - | Test Code for Sound Rating Air Moving Devices. |
| F. | AMCA 301 - | Methods for Calculating Fan Sound Ratings from Laboratory Test Data. |

### 1.3 SUBMITTALS

A. Product Data: Provide data on fans and accessories including fan curves indicating CFM, SP, RPM, and BHP with specified operating point plotted, efficiencies defined, sound power levels for both fan inlet and outlet at rated capacity for all octave bands (indicated in units of 10 to the minus 12 watts), and electrical characteristics and connection requirements.
B. Manufacturer's Installation Instructions.

### 1.4 PROJECT CLOSEOUT SUBMITTALS

A. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

### 1.5 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.
D. Temperature Limit: Maximum 180°F.
E. Static and Dynamic Balance: To reduce vibration and noise transmission to occupied areas.
F. Performance Base: Sea level conditions.

## PART 2 PRODUCTS

### 2.1 SWSI/DWDI CONFIGURATION

A. Manufacturers:
   1. Acme.
   2. Barry.
   3. Bayley.
   4. Buffalo.

5. Chicago.
6. Cook.
7. Greenheck.
8. Twin City.

B. Wheel and Inlet:
1. Backward Inclined: Steel construction with smooth curved flanged inlet, back plate, backwardly inclined blades welded or riveted to flange and back plate; cast iron hub bolted or riveted where applicable to back plate and keyed to shaft with set screws.
2. Forward Curved: Steel construction with flanged inlet, back plate, shallow blades with inlet and tip curved forward in direction of airflow, mechanically secured to flange and back plate; steel hub swaged to back plate and keyed to shaft with set screw.
3. Airfoil: Steel construction with smooth curved flanged inlet, heavy back plate die formed hollow airfoil shaped blades continuously welded at tip flange, and back plate; cast iron hub bolted or riveted to back plate and keyed to shaft with set screws. Wheel shall have true non-overloading performance characteristics.
4. Radial: Steel construction with inlet flange, back plate, plate blades with reinforcing gussets welded or riveted to back plate, cast iron hub bolted or riveted where applicable to back plate and keyed to shaft with set screws.
5. Finish: Factory finish with manufacturer's standard primer and finish enamel or equivalent coat.

C. Housing:
1. Steel, spot welded for AMCA 99 Class I and II fans, and continuously welded for Class III, braced, designed to minimize turbulence with spun inlet bell and shaped cut-off.
2. Factory finish before assembly with manufacturer's standard primer and finish enamel or equivalent coat.
3. Bolted construction with horizontal flanged split housing where indicated.

## 2.2 BEARINGS AND DRIVES

A. Bearings:
1. Style: Air handling quality.
2. Type:
   a. SWSI/DWDI Fans: Heavy duty, concentric locking pillow block, self-aligning, grease-lubricated ball or roller bearings.
   b. Designed with low swivel torque to allow the outer race of the bearing to pivot or swivel within the cast pillow block.
3. Testing:
   a. Bearings shall be 100% tested for noise and vibration by the manufacturer.
   b. Bearings shall be 100% tested to insure the inner race diameter is within tolerance to prevent vibration.
4. ABMA L-10 Life: 200,000 80,000 hours at maximum operating speed for each pressure class.
5. Provide bearings with Zerk fittings for lubrication.

B. Shafts: Hot rolled steel, ground and polished, with key-way, protectively coated with lubricating oil, and shaft guard.

## 2.3 FAN ACCESSORIES

A. Access Doors: Shaped to conform to scroll, with quick opening latches and gaskets.
B. Scroll Drain: 1/2 inch steel pipe coupling welded to low point of fan scroll.
C. Screens: Galvanized steel welded grid, construction to meet OSHA requirements.
D. Extended Grease Line: For all fans with inlet ductwork, or where belt guards or other accessories block access for lubrication.
E. Weatherproof Hood: Provide for all utility set arrangements (Arrangements 9 & 10).

F. Moist Air Finish: For fans as indicated, all parts in air-stream shall be coated with vinyl enamel-3 mils thick, Eisen-Heiss #320 epoxy coating-5 mills thick, or equivalent.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide safety screen where inlet or outlet is exposed.
C. Provide nipple and cap at scroll drain.
D. Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.
E. Fan wheels shall be manually rotated a minimum of 10 full rotations at least once per month until final acceptance of the project.

END OF SECTION

# SECTION 23 37 00 - AIR OUTLETS AND INLETS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Grilles and diffusers.
B. Slot diffusers.

### 1.2 REFERENCES

| | | |
|---|---|---|
| A. | ADC 1062 - | Certification, Rating and Test Manual. |
| B. | AMCA 500 - | Test Method for Louvers, Dampers and Shutters. |
| C. | AMCA 511 - | Certified Ratings Program for Air Control Devices. |
| D. | ASHRAE 70 - | Method of Testing for Rating the Air Flow Performance of Outlets and Inlets. |
| E. | SMACNA - | HVAC Duct Construction Standard - Metal and Flexible. |
| F. | FGI - | Guidelines for Design and Construction of Hospitals and Outpatient Health, Care and Support Facilities. |
| G. | UL 181 - | Standard for Safety for Factory-Made Air Ducts and Air Connectors. |
| H. | NFPA 90A - | Installation of Air Conditioning and Ventilating Systems. |

### 1.3 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Submit schedule of outlets and inlets showing type, size, location, application, noise level, mounting type, and accessories.

### 1.4 QUALITY ASSURANCE

A. Grilles and slot diffusers: Performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.

## PART 2 PRODUCTS

### 2.1 GRILLES AND DIFFUSERS

A. Manufacturers:
   1. Anemostat.
   2. Carnes.
   3. Krueger.
   4. Metalaire.
   5. Price.
   6. Titus.
   7. Tuttle & Bailey.
B. Fabrication:
   1. Steel or aluminum frames and blades as scheduled.
   2. Louvered ceiling diffusers of stamped construction, with adjustable vanes and air pattern as scheduled.
   3. Perforated ceiling diffusers of 3/16” holes on 1/4” staggered centers, with removable face and fully adjustable pattern controllers.
   4. Supply grilles of double deflection with horizontal front bars and vertical rear bars at 3/4” spacing.

5. Linear bar grilles of continuous slots, number and size as scheduled, with fixed discharge vanes.
6. Louvered face return/transfer grilles of fixed angled blades 35° deflection at 3/4” spacing.
7. Ceiling fixed grid eggcrate grilles of 1/2” x 1/2” x 1/2” aluminum louvers.
8. Drum diffusers of pivoting vanes and rotating drum with felt seal.

C. Dampers (where scheduled): Steel opposed blade key operated with hidden operator.

D. Frame:
1. Lay-in: Provide grille in 24" x 24" nominal panel of same material as grille suitable for lay-in T-bar ceiling installation. Frames with screw holes are not acceptable for lay-in applications.
2. Flange: Provide grille with frame and counter sunk screw holes suitable for surface mounting.
3. Channel: Provide grille with channel frame suitable for installation in a 24" x 24" T-bar ceiling and with duct connection.
4. Tegular: Provide lay-in grille with dropped face 3/8" below the T-bar grid.
5. Snap-in: Provide grille in nominal 12" x 24" or 24" x 24" panel as applicable, with frame suitable for mounting in metal pan ceiling.

E. Finish:
1. White (or other colored finish as scheduled): Acrylic baked enamel finish.
2. Anodized: Brushed satin aluminum with a clear anodize finish.
3. Satin Polish: For stainless steel grilles.

F. Return/exhaust inlets less than 7 feet above the floor: Removable core and field installed screen.

## 2.2 SLOT DIFFUSERS

A. Manufacturers:
1. Trane.
2. Carnes.
3. Donco.
4. Titus.

B. Diffuser Plenum:
1. Galvanized sheet metal.
2. Height: Minimum available for round flexible duct connection.
3. Lining: 1/2" thick acoustical and thermal insulation with a flame spread rating of not over 25 and a smoke developed rating of not over 50.
4. Lining: Comply with the latest edition of FGI’s Guidelines for Design and Construction of Healthcare Facilities, UL 181, NFPA 90A and the Bacteriological Standards of ASTM C665.
   a. Non-porous foil skin.
   b. Minimum 1/2" thick fiberglass, 2 lb. density.
   c. All interior edges sealed or covered to prevent exposure of the fiberglass to the air stream.

C. Finish: White enamel.

D. Center notch: In all four (4) foot slots installed in two (2) foot by two (2) foot ceiling grids.

E. Unit to match T-bar ceiling system (provided by others).

F. Provide plaster frame for slot diffusers installed in plaster/drywall ceilings.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Cooperate with the appropriate Contractor to ensure that the installation of grilles, etc. in suspended ceiling are centered relative to exposed suspension systems and tile increments.
B. Provide square to round transitions at grilles for flexible or round duct connections.
C. Duct diffusers and grilles with airtight connections.
D. Paint ductwork visible behind air inlets and outlets matte black.
E. Grilles installed in the horizontal plane in rooms without ceilings shall be installed 8'-0" above the finished floor.

END OF SECTION

# SECTION 23 40 00 - AIR CLEANING DEVICES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Pleated Filters
B. Cartridge Filters.
C. Filter gauges.

### 1.2 REFERENCES

A. ASHRAE 52 - Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
B. Fed. Std. 209D
C. UL 586 - Test Performance of High Efficiency Particulate, Air Filter Units.
D. UL 900 - Test Performance of Air Filter Units.

### 1.3 DESIGN REQUIREMENTS

A. UL 900 Class 1 filters unless noted otherwise.
B. Efficiencies are based on ASHRAE Standard 52-76.
C. Minimum Efficiency Reporting Values (MERV) are based on ASHRAE 52.2-1999.

### 1.4 SUBMITTALS

A. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, and dimensions.
B. Manufacturer's installation instructions: Indicate assembly and change-out procedures.

### 1.5 CONTRACT CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.

### 1.6 EXTRA MATERIALS

A. Furnish one (1) additional set of media to the owner for each filter bank. This set is in addition to the final set specified to be installed prior to air balancing, and in addition to filters used during the construction period and/or the use of the equipment for temporary heating/ventilation/cooling.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. Camfil Farr.
B. Cameron.
C. Filtration Group.
D. Flanders.
E. Hydrosil.
F. Purolator.
G. Purafil.

## 2.2 PLEATED FILTERS

A. Media: 100% synthetic self-supporting media.
B. Frame:
   1. Heavy duty moisture resistant board with downstream center support struts.
   2. Frame and media designed to allow for any abuse due to shipping and handling without damage to filter.
C. Efficiency: ASHRAE Test Standard 52.2.
   1. 25-30% (MERV 7).
   2. 30-40% (MERV 8).
D. Media: 100% synthetic media bonded to a metal grid on downstream side.
E. Frame:
   1. Heavy duty moisture resistant die cut frame.
   2. Front and back media retainers shall be integral to filter frame.
   3. Media continuously bonded to filter frame.
   4. Integral pleat separators on 4” filters and deeper filters.
F. Efficiency: ASHRAE Test Standard 52.2.
   1. 25-30% (MERV 7).
   2. 30-40% (MERV 8).
   3. 60-65% (MERV 11).
   4. 80-85% (MERV 13).

## 2.3 CARTRIDGE FILTERS

A. Media: Wet laid micro-glass or 100% synthetic media.
B. Frame: High impact plastic with steel or high impact plastic struts.
C. V-Bank Style: 1” media packs (2V or 4V) in 12” deep design.
D. Efficiency: ASHRAE Test Standard 52.2.
   1. 25-30% (MERV 7).
   2. 80-85% (MERV 13).
   3. 95% (MERV 14).
   4. 98% (MERV 15).
E. Maximum Initial Pressure Drops:
   1. 2V: 0.52” W.G. at 500 FPM.
   2. 4V: 0.38” W.G. at 500 FPM.
F. Environment: 0-100% RH, condensing.

## 2.4 FILTER GAUGES

A. “Typical” Filter Gauge:
   1. Manufacturer: Dwyer, 2000 Series.
   2. Construction:
      a. 4 inch diameter dial in metal case.
      b. Diaphragm actuated.
      c. Black figures on white background.
      d. Front recalibration adjustment.
   3. Accuracy: 2 percent of full scale accuracy.
   4. Accessories:
      a. Static pressure tips with compression fittings for bulkhead mounting.
      b. 1/4 inch diameter tubing and vent valves.
   5. Range: 0-2 inch w.g.
B. DDC Filter Gauge:
   1. Manufacturer: Dwyer, 605 Series.
   2. Construction:
      a. 4 inch diameter dial in metal case.
      b. Diaphragm actuated.
      c. Black figures on white background.

d. Front recalibration adjustment.
3. Accuracy: 1 percent of full scale accuracy.
4. Output Signal: 4-20mA.
5. Accessories:
a. Static pressure tips with compression fittings for bulkhead mounting.
b. 1/4 inch diameter tubing and vent valves.
6. Range: 0-2 inch w.g.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Where air handling equipment is to be used for temporary heating or ventilation of a facility, do not operate or allow operation of the equipment until specified temporary filter media has been installed. Contractor shall be responsible for maintaining the cleanliness of air handling apparatus and air distribution systems during construction through regular inspection and changing of filter media throughout the construction period.
C. Where air handling apparatus is used during the construction period, install a complete final set of new filter media just prior to start of air balancing.
D. Reinforce filter holding frames per manufacturer's instructions.
E. Caulk between filter frames, between frames and stiffener bars and all flashing.
F. Maintain necessary clearance for changing filters.
G. Install filter gauge static pressure tips upstream and downstream of filters.
H. Mount gauge on outside of filter housing, or ductwork in accessible position.
I. Install tubing and gauge valves between gauge and sensor tips.
J. Adjust and level each gauge.
K. Provide the following filter type for use during construction:
1. Air handling units: Throwaway cartridge, 30% efficiency, minimum, size to suit filter modules.

END OF SECTION

# SECTION 23 54 16 - GAS FIRED HEATERS/DUCT FURNACES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Gas Fired Duct Furnaces - Outdoor.

### 1.2 REFERENCES

A. ANSI/NEMA MG 1 - Motors and Generators.
B. NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.
C. NFPA 54 - National Fuel Gas Code.

### 1.3 SUBMITTALS

A. Product Data: Provide manufacturer's literature and data indicating rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams. Indicate assembly, required clearances, and location and size of field connections.
B. Manufacturer's Installation Instructions: Indicate rigging, assembly, and installation instructions.

### 1.4 CONTRACT CLOSEOUT SUBMITTALS

A. Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listing.

### 1.5 REGULATORY REQUIREMENTS

A. Duct Furnaces: AGA certified.

## PART 2 PRODUCTS

### 2.1 DUCT FURNACES – OUTDOOR

A. Manufacturers:
   1. Modine.
   2. Trane.
   3. Reznor.
   4. Hastings.
B. Units: Self-contained, packaged, factory assembled, pre-wired unit.
C. Casing: 22 gauge aluminized steel with baked enamel finish.
D. Burner Material: 409 stainless steel, minimum 28 gauge.
E. Heat Exchanger: 409 stainless steel welded construction, minimum 20 gauge.
F. Duct Connectors: Flanges on inlet and outlet.
G. Air Distribution Baffles: Upstream of heat exchanger.
H. Accessories:
   1. Drain pipe connecting flange.
   2. Power venter prewired with thermal overload protection.
   3. Drain Pan: Collect condensate and function as air baffle to shield burner from drafts, constructed of stainless steel.

I. Controls – Pre-piped and wired:
   1. Gas pressure regulator, low voltage transformer, low voltage automatic combination redundant gas valve, pilot safety valve, overheat control, manual gas shutoff valve and automatic 100% gas shutoff system, electric intermittent pilot ignition where pilot is lit only when main burner is firing.
   2. Gas Burner Safety Controls: Thermo-couple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.
   3. High Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on high bonnet temperature and re-energizes when temperature drops to lower value.

J. Operating Controls:
   1. Unit shall include electronic modulating automatic gas valve and controls, with control interface to the associated dehumidification unit controls.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install conforming to NFPA 90B, and NFPA 54.
C. Provide vent connections according to NFPA 211.
D. Install all required gas vent piping, outlet terminals, combustion air inlet terminals and combustion air ductwork.
E. Install horizontal and vertical venting and combustion air ducting as recommended by the separated combustion unit heater manufacturer. Only piping, ductwork and terminal devices furnished by the unit heater manufacturer shall be approved for use.

END OF SECTION

# SECTION 23 72 13 - DESICCANT DEHUMIDIFICATION UNIT

**NOTE: UNIT PRE-PURCHASED BY OWNER, INCLUDED FOR INFORMATION ONLY**

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Desiccant Dehumidification Rotor.
B. Reactivation Air Section.
C. Controls.

### 1.2 REFERENCES

A. ASHRAE 84 - Method of Testing Air-to-Air Heat/Energy Exchangers.
B. ARI 1060.
C. Specification 23 73 23 – Custom Packaged Air Handling Units.

### 1.3 EQUIPMENT PROVIDED BY THIS SECTION BUT INSTALLED BY OTHERS

A. Variable Frequency Drive (VFD): Wired by Division 26.
B. Temperature controller, temperature sensors, rotation detector: Installed and wired by Temperature Control Contractor.

### 1.4 SUBMITTALS

A. Shop Drawings: Indicate components, assembly, dimensions, weights.
B. Product Data: Indicate entering and leaving air temperatures, pressure drops, purge volume, motor HP, accessories and job tailored wiring diagrams.
C. Submit manufacturer's installation data.

### 1.5 PROJECT CLOSE-OUT SUBMITTALS

A. Operation and Maintenance Data: Include start-up instructions, start-up log, maintenance data, parts lists, controls and accessories.

### 1.6 QUALITY ASSURANCE

A. Efficiencies independently verified in accordance with ASHRAE 84 and ARI 1060.

### 1.7 DELIVERY, STORAGE AND PROTECTION

A. Comply with manufacturer's installation instruction for rigging, unloading and transporting units.
B. Protect units from physical damage.

### 1.8 WARRANTY

A. Manufacturer warrants desiccant dehumidification unit to be free of defects in material and workmanship for 24 months from the date of factory shipment.
B. Rotor and drive system to have a five year warranty.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. Climate by Design.
B. Approved Equal.

### 2.2 GENERAL

A. Desiccant dehumidification unit to include outdoor intake air section, supply air fan, desiccant wheel and drive system, reactivation air heater and fan with inlet filters, and unit controls.

### 2.3 ROTOR

A. Rotor Support: Stainless steel framework with individual segments removable for servicing. Design shall allow replacement of rotor section without requiring side access.
B. Media: Silica gel desiccant permanently bonded to a polymer film matrix; cleanable with either vacuum cleaner or water and detergent wash without degrading performance.
C. Flame spread less than 25 and smoke developed less than 50.
D. Bearings: Pillow Block Type; replaceable without removing rotor from casing or media from spoke system. Extended grease fittings.

### 2.4 FRAME AND HOUSING

A. Frame: Structural steel tube, electrically welded, epoxy primed and finished with alkyd enamel.
B. Maximum Rotor Deflection: 1/32" due to air pressure loss.
C. Casing: Removable galvanized steel panels.

### 2.5 PURGE SECTOR/ROTOR SEALS

A. Purge Sector: Factory set, field adjustable.
B. Rotor Seals: Non-contacting, multi-pass, labyrinth type.
C. Contamination: 0.04% (max.) exhaust stream concentration at 10" W.G.

### 2.6 DRIVE SYSTEM

A. Motor: Fractional AC motor, with internal overload protection, mounted in supply airstream side of wheel, located out of airstream.
B. Drive: Perimeter 3 rotor belts driven by motor through a jackshaft mounted on unit frame. Extended grease links for jackshaft bearings.
C. VFD: Variable Frequency Drive with turn down from 20 RPM to 1/4 RPM. NEMA 1 enclosure.

### 2.7 REACTIVATION AIR

A. Reactivation – Direct Fired Burner
   1. The reactivation heat source shall be full-modulation direct-fired natural gas. The capacity of the burner shall be sufficient to provide scheduled performance at design cool-day conditions of 50˚ FDB.

2. The gas burner shall be fully modulating, with turn-down ratio of 20:1. The gas burner shall have stainless steel baffles and non-clogging gas orifices. The burner assembly and complete pre-piped manifold shall include main and pilot gas regulators, redundant main solenoid shut off valves, electronic modulating rate control valve, pilot solenoid valve, Gas hand-valves and adjustable burner air flow profile plates. Butterfly type modulating gas valves are not acceptable.
3. Gas trains shall meet or exceed UL795.
4. Pilot Burner flame safeguard control system shall be industrial burner programmer with intermittent pilot, pre-purge system and flame rectification proving system.
5. The gas burner shall be rated at no more than 390 MBH per foot of burner length, in order to limit flame length, and minimize the generation of carbon monoxide.
6. The control safety devices shall include: air flow proving device, high temperature limit switch, electronic primary flame safeguard with flame rod rectification, microprocessor rate controller, reactivation fan motor starter interlock and seven second combustion chamber pre-purge. Complete assemblies shall be pre-piped, wired, and tested.

B. Reactivation – Fan and Motor
1. Reactivation air fan shall be single width, single inlet, direct drive, and fabricated of aluminum to minimize the potential for corrosion.
2. Motors shall be TEFC, NEMA premium efficiency, 3 phase, 60 Hz.
3. Fan and motor shall be dynamically balanced as an assembly to 0.15 IPS per AMCA 204-05, balance class BV-3.
4. A piezometer flow measurement ring shall be provided with pressure taps to the exterior of the unit.
5. Outlet system balancing damper shall be single 304 stainless steel damper blade and include a locking quadrant.
6. Reactivation outlet sound attenuator shall be included. The attenuator shall be lined to protect from the high moisture air stream of reactivation.

## 2.8 CONTROLS

A. Controller: DDC control system with adjustable supply and exhaust setpoints, LED readouts, auto summer/winter changeover and auto frost control.
B. Temperature Sensors: Outside air, supply air, return air and exhaust air.
C. Humidity Sensor: Duct mounted, Vaisala DMT143L or equivalent.
D. Rotation Detector: Monitors rotor movement; contacts for remote alarm.
E. Enclosure: NEMA 1.

# PART 3 EXECUTION

## 3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Mount VFD adjacent to unit.
C. Support unit independently of ductwork.
D. Attach ductwork to unit with flanges.
E. Grease bearings prior to start-up.

## 3.2 MANUFACTURER'S FIELD SERVICES

A. Provide the services of a factory authorized representative for a minimum of eight (8) hours per unit to inspect installation, adjust controls and instruct Owner on maintenance of unit.
B. Verify all wiring connections. Verify operation of controls.

C. Adjust supply air temperature setpoint to temperature scheduled.
D. Adjust exhaust air temperature setpoint to a temperature which will prevent frosting and condensation.
E. Measure differential pressure across unit and adjust purge sector to minimize cross contamination.

END OF SECTION

## SECTION 23 81 29 - VARIABLE REFRIGERANT FLOW (VRF) HVAC SYSTEM

### PART 1 GENERAL

### 1.1 SUMMARY

A. Variable refrigerant flow (VRF) HVAC system includes:
   1. Outdoor/Condensing unit(s).
   2. Indoor/Evaporator units.
   3. Branch selector units.
   4. Refrigerant piping.
   5. Control panels.
   6. Control wiring.

### 1.2 REFERENCE STANDARDS

| | | |
|---|---|---|
| A. | AHRI 210/240 – | Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008. |
| B. | ARI 270 - | Sound Rating of Outdoor Unitary Equipment. |
| C. | ASHRAE 90A - | Energy Conservation in new Building Design. |
| D. | NFPA 70 – | National Electrical Code; National Fire Protection Association. |
| E. | NFPA 90A - | Installation of Air Conditioning and Ventilation Systems. |
| F. | UL 1995 – | Heating and Cooling Equipment; Current Edition, Including All Revisions. |

### 1.3 SUBMITTALS

A. Product Data:
   1. Indicate assembly, required clearances, unit construction details, component support and accessory details, and field connection details.
   2. Provide schematic layouts showing condensing units, cooling coils, refrigerant piping layout (including pipe sizes), and refrigerant accessories required for complete system.
   3. Provide literature, which indicates dimensions, weights, capacities, ratings, gauges, and finishes of materials.
   4. Provide data on coil dimensions, materials, rows, connections, and all performance data.
   5. Provide electrical nameplate data, and wiring diagrams.
   6. Submit sound power level data indoor and outdoor units.
B. Confirmation of manufacturer start-up, one (1) year service, and warranty.
C. Submit manufacturer's installation instructions.
D. Pre-Bid Submittals: For proposed substitute systems/products, as defined in PART 2, and alternate systems/products, as defined above, contractor shall submit all data described in this article, under the terms given for substitutions stated in PART 2.

### 1.4 MANUFACTURERS FIELD SERVICES

A. Prepare and start systems.
B. A written report shall be submitted to the owner (by the unit manufacturer) indicating that satisfactory completion of start-up is finished.
C. The responsibility of the manufacturer’s field services shall extend to include any items, which cannot be verified during an initial trip (due to the associated systems not being in service). The manufacturer is responsible to address any similar outstanding items in subsequent trip/s as required, and report on the results accordingly.
D. All expenses are to be included in the manufacturer’s services.

E. Start-up services furnished by the unit manufacturer including:
   1. Refrigerant piping pressure test.
   2. Full evacuation.
   3. Refrigerant and oil charging.
   4. Completed operating log.

## 1.5 CONTRACT CLOSEOUT SUBMITTAL

A. Operation and Maintenance Data: Include start-up instructions, maintenance instructions, parts lists, spare parts lists, wiring diagrams, controls and accessories.

## 1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.
   2. Company that provides system design software to installers.
B. Installer Qualifications: Trained and approved by manufacturer of equipment.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

## 1.8 WARRANTY

A. Replace any defective equipment or part for a period of one (1) year from the date of owner acceptance.
B. Compressors: Provide manufacturer's warranty for five (5) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of the manufacturer according to the manufacturer’s terms and conditions. All warranty service work shall be performed by a factory trained service professional.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

A. Basis of Design: The system design shown in the contract documents is based on equipment and system designed by DAikin. Alternate manufacturers shall include all necessary equipment and accessories necessary for a complete operating system, in addition to those shown and specified.
B. Manufacturers:
   1. Daikin.
   2. Mitsubishi Electric/Trane.
   3. Sanyo.
   4. LG.
   5. Samsung.
   6. Approved equal.
C. Systems designed and manufactured by other manufacturers will be considered under the terms described for substitutions, with the following exceptions:
   1. Substitution requests will be considered only if received at least 10 days prior to the bid date.
   2. Substitution requests will be considered only if required submittal data is complete; see article SUBMITTALS above.

3. Contractor (not equipment supplier) shall certify that the use of the substitute system and equipment will not require changes to other work or re-design by.
4. Do not assume substitution has been accepted until formal written notice has been issued by.

## 2.2 HVAC SYSTEM DESIGN

A. System Operation: Cooling only, Heating and Cooling, or Heating and Cooling Simultaneously as indicated. System shall be capable of changing mode without interruption to system operation.
   1. Zoning: Provide heating/cooling selection for each individual indoor/evaporator unit independently of all other units.
   2. Provide a complete functional system that achieves the specified performance based on the specified design conditions and that is designed and constructed according to the equipment manufacturer's requirements.
   3. Conditioned spaces are shown on the drawings.
   4. Branch selector unit locations are not shown on the drawings.
   5. Required equipment unit capacities are shown on the drawings.
   6. Refrigerant piping sizes are not shown on the drawings.
   7. Connect equipment to proper condensate piping; condensate piping is shown on the drawings.
B. Cooling Mode Interior Performance:
   1. Daytime Setpoint: 72 degrees F, plus or minus 2 degrees F.
   2. Setpoint Range: 57 degrees F to 77 degrees F.
   3. Night Setback: 78 degrees F.
C. Heating Mode Interior Performance:
   1. Daytime Setpoint: 70 degrees F, plus or minus 2 degrees F.
   2. Setpoint Range: 59 degrees F to 80 degrees F.
   3. Night Setback: 62 degrees F.
D. Outside Air Design Conditions:
   1. Summer Outside Air Design Temperature: 93 degrees F dry-bulb; 75 degrees F wet-bulb.
   2. Winter Outside Air Design Temperature: -10 degrees F dry-bulb.
E. Controls: Provide the following control interfaces:
   1. For Each Indoor/Evaporator Unit: One wall-mounted wired "local" controller, with temperature sensor; locate where indicated.
F. Local Controllers: Wall-mounted, wired, containing temperature sensor. Provide with 2 degree (dead band) control.
G. Remote Temperature Sensors: In addition to temperature sensors integral with indoor/evaporator units, provide wall-mounted, wired remote temperature sensors located in the same room for the following:
   1. In-ceiling mounted units.
   2. Exception: Where a local controller with temperature sensor is provided for the particular unit and is located in the same space.

## 2.3 EQUIPMENT

A. All Units: Factory assembled, wired, and piped and factory tested for function and safety.
   1. Refrigerant: R-410A.
   2. Performance Certification: AHRI Certified; www.ahrinet.org.
   3. Safety Certification: Tested to UL 1995 by UL or Intertek-ETL and bearing the certification label.
   4. Provide outdoor/condensing units capable of serving indoor unit capacity up to 200 percent of the capacity of the outdoor/condensing unit.
   5. Provide units capable of serving the zones indicated.

6. Thermal Performance: Provide heating and cooling capacity as indicated, based on the following nominal operating conditions:
7. Energy Efficiency: Report EER and COP based on tests conducted at “full load” in accordance with AHRI 210/240 or alternate test method approved by U.S. Department of Energy.

B. Refrigerant Piping:
1. Provide complete refrigerant system, including high/low pressure dedicated hot gas, liquid and suction lines.
2. Insulate each refrigerant line individually between the condensing and indoor units.

## 2.4 OUTDOOR/CONDENSING UNITS

A. Outdoor/Condensing Units: Air-cooled DX refrigeration units, designed specifically for use with indoor/evaporator units; factory assembled and wired with all necessary electronic and refrigerant controls; modular design to serve multiple units.
1. Refrigeration Circuit: Scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
2. Refrigerant: Factory charged.
3. Variable Volume Control: Modulate compressor capacity automatically to maintain constant suction and condensing pressures while varying refrigerant volume to suit heating/cooling loads.
4. Capable of being installed with wiring and piping to the left, right, rear or bottom.
5. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source; during heating operation, reverse cycle (cooling mode) oil return or defrost is not permitted, due to potential reduction in space temperature.
6. Sound Pressure Level: As specified, measured at 3 feet from front of unit; provide night setback sound control as a standard feature; three selectable sound level steps of 55 dB, 50 dB, and 45 dB, maximum.
7. Power Failure Mode: Automatically restart operation after power failure without loss of programmed settings.
8. Safety Devices: High pressure sensor and switch, low pressure sensor/switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
9. Provide refrigerant sub-cooling to ensure the liquid refrigerant does not flash when supplying to us indoor units.
10. Oil Recovery Cycle: Automatic, occurring 2 hours after start of operation and then every 8 hours of operation; maintain continuous heating during oil return operation.
11. Unit must defrost all circuits simultaneously.
12. Provide with unit mounted weatherproof disconnect switch.

B. Unit Cabinet: Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.
1. Designed to allow side-by-side installation with minimum spacing.
2. Provide with snow/hail guard.

C. Fans: One or more direct-drive propeller type, vertical discharge, with multiple speed operation via DC (digitally commutating) inverter.
1. External Static Pressure: Factory set at 0.12 in WG, minimum.
2. Indoor Mounted Air-Cooled Units: External static pressure field set at 0.32 in WG, minimum; provide for mounting of field-installed ducts.
3. Fan Airflow: As indicated for specific equipment.
4. Fan Motors: Factory installed; permanently lubricated bearings; inherent protection; fan guard; output as indicated for specific equipment.

D. Condenser Coils: Copper tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.
E. Compressors: Scroll type, hermetically sealed, variable speed inverter-driven and fixed speed in combination to suit total capacity; minimum of one variable speed, inverter driven compressor per condenser unit; minimum of two compressors per condenser unit; capable of controlling capacity within range of 6 percent to 100 percent of total capacity.
   1. Multiple Condenser Modules: Balance total operation hours of compressors by means of duty cycling function, providing for sequential starting of each module at each start/stop cycle, completion of oil return, and completion of defrost, or every 8 hours.
   2. Failure Mode: In the event of compressor failure, operate remaining compressor(s) at proportionally reduced capacity; provide microprocessor and associated controls specifically designed to address this condition.
   3. Provide each compressor with crankcase heater, high pressure safety switch, and internal thermal overload protector.
   4. Provide oil separators and intelligent oil management system.
   5. Provide spring mounted vibration isolators.
F. Accessories:
   1. Low ambient cooling kit, complete with control damper assembly and wind deflectors.
   2. Hail/Snow hoods.
   3. Base pan electric heaters, including relay and mounting brackets for a complete installation.

## 2.5 BRANCH SELECTOR UNITS

A. Branch Selector Units: Concealed boxes designed specifically for this type of system to control heating/cooling mode selection of downstream units; consisting of electronic expansion valves, subcooling heat exchanger, refrigerant control piping and electronics to facilitate communications between unit and main processor and between branch unit and indoor/evaporator units.
B. Provide service valves on the discharge of each branch refrigerant pipe connection at the branch selector unit.
C. Control direction of refrigerant flow using electronic expansion valves; use of solenoid valves for changeover and pressure equalization is not permitted due to refrigerant noise.
D. Multi-port branch selector boxes shall include a minimum of (1) spare port for future connection and redundancy.
E. Provide one electronic expansion valve for each downstream unit served, except multiple indoor/evaporator units may be connected, provided balancing joints are used in downstream piping and total capacity is within capacity range of the branch selector.
F. When branch unit is simultaneously heating and cooling, energize subcooling heat exchanger.
G. Casing: Galvanized steel sheet; with flame and heat resistant foamed polyethylene sound and thermal insulation.
H. Refrigerant Connections: Braze type.
I. Condensate Drainage: Provide with drain connection for units where condensation may occur.

## 2.6 INDOOR/EVAPORATOR UNITS

A. General:
   1. Unit shall be factory assembled, wired, piped and run tested.
   2. Cabinet Assembly:
      a. Unit shall have access doors for internal service and filter maintenance.
      b. Unit shall be equipped with factory installed temperature thermistors for
         1. Return air.
         2. Refrigerant entering coil.
         3. Refrigerant leaving coil.
      c. Unit shall have a factory assembled, piped and wired electronic expansion valve (EEV) for refrigerant control.
      d. Unit shall have a built-in control panel to communicate with other indoor units and to the outdoor unit via BACnet.
      e. Unit shall have the following functions as standard
         1. Self-diagnostic function.
         2. Auto restart function.
         3. Auto changeover function (Simultaneous Heating and Cooling systems only).
         4. Auto operation function.
         5. Forced operation.
         6. Dual thermistor control.
         7. Sleep mode.
         8. External static pressure (ESP) control.
   3. Fan Assembly:
      a. Fan: Direct-drive turbo type.
      b. The fan/motor assembly shall be mounted on vibration attenuating rubber grommets.
      c. The fan speed shall be controlled using microprocessor based direct digitally controlled algorithm.
      d. In cooling mode, the indoor fan shall have the following settings: Low, Med, High and Auto.
      e. The Auto fan setting shall adjust the fan speed to most effectively achieve the set-point.
      f. Each of the settings can be field adjusted from the factory setting (RPM/ESP).
      g. Unit shall be designed for high speed air volume against an external static pressure of up to 1.0” water gauge.
   4. Filter Assembly:
      a. The return air inlet shall have a factory supplied removable, washable filter.
      b. Return filter box with high-efficiency filter shall be field provided and installed not to exceed external static pressure limitation of the high static ducted indoor unit.
   5. Coil Assembly:
      a. Unit shall have a factory built coil comprised of aluminum fins mechanically bonded on copper tubing.
      b. Unit shall have minimum of 2 or 3 rows of coils, as required to meet scheduled unit capacity.
      c. Unit shall have a factory supplied condensate drain pan below the coil.
      d. Unit shall be installed and wired with built-in condensate drain pump. The drain pump shall have a safety switch to shut off the unit if condensate rises too high in the drain pan. Condensate pump to provide a minimum lift of 21 inches.
      e. Unit shall have provision of 45° flare refrigerant pipe connections
      f. The coil shall be factory pressure tested at a minimum of 551 psig.
      g. All refrigerant piping from outdoor unit to indoor unit shall be field insulated.

6. Microprocessor Control:
   a. The unit shall have a factory installed microprocessor controller capable of performing functions necessary to operate the system.
   b. The unit shall be able to communicate with other indoor units and the outdoor unit using a field supplied minimum of 18 AWG, 2 core, stranded and shielded communication cable.
   c. The unit controls shall operate the indoor unit using one of the five operating modes:
      9. Auto changeover (Simultaneous Heating and Cooling systems only).
      10. Heating.
      11. Cooling.
      12. Dry.
      13. Fan only.
7. Electrical:
   a. The unit electrical power shall be 208-230/1/60 (V/Ph/Hz) unless indicated otherwise.
   b. The unit shall be capable of operating within voltage limits of +/- 10% of the rated voltage.
   c. Provide equipment with unit mounted disconnect switch.
8. Controls:
   a. Unit shall use controls provided by the manufacturer to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over an RS485 daisy chain.

B. Ceiling Mounted Units:
   1. Four-way airflow cassette with central return air grille.
   2. Exposed Housing: White, impact resistant, with washable decoration panel.
   3. Maintenance Access: All electrical components and filter accessible through decoration panel.
   4. Supply Airflow Adjustment:
      a. Via motorized louvers which can be horizontally and vertically adjusted from 0 to 90 degrees.
      b. Field-modifiable to 3-way and 2-way airflow.
      c. Three auto-swing positions, including standard, draft prevention and ceiling stain prevention.
   5. Sound Pressure: Measured at low speed at 5 feet below unit.
   6. Provide side-mounted fresh air intake duct connection.

C. Wall Mounted Units:
   1. Exposed Housing: White, impact resistant panel.
   2. Maintenance Access: All electrical components and filter accessible through front panel.
   3. Supply Airflow Adjustment:
      a. Multiple vane settings.
      b. Swing setting via motorized louvers which can be horizontally and vertically adjusted from 0 to 90 degrees.
   4. Sound Pressure: Measured at low speed at 5 feet below unit.

D. Floor Standing Units:

E. Concealed Ducted Units:

## 2.7 CONTROLS

A. The control system shall consist of a low voltage communication network of unitary built-in controllers with on-board communications and a web-based operator interface. A web controller with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

B. System controls and control components shall be installed in accordance with the manufacturer’s written installation instructions.
C. Furnish energy conservation features such as optimal start, night setback, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.
D. System shall provide direct and reverse-acting on and off algorithms based on an input condition or group conditions to cycle a binary output or multiple binary outputs.
E. Provide capability for future system expansion to include monitoring and use of occupant card access, lighting control and general equipment control.
F. System shall be capable of email or text message generation for remote alarm annunciation.

## PART 3 EXECUTION

### 3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install refrigerant piping in accordance with equipment manufacturer's instructions.
C. Provide refrigerant isolation valves at each cassette unit to allow service to any indoor unit without interruption to overall system operation.
D. Provide initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period.
E. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.
F. Provide condensate drain piping from indoor units to the locations indicated.
G. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).
H. Coordinate with installers of systems and equipment connecting to this system.
I. Each VRF system shall include at least one (1) unused branch for future use. Branches shall be fully installed & wired in central location with capped service shutoff valve & service port.

### 3.2 FIELD QUALITY CONTROL

A. Provide manufacturer's field representative to inspect installation prior to startup.

### 3.3 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform system startup.
B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.
C. Adjust equipment for proper operation within manufacturer's published tolerances.
D. Condensing unit start-up provided by the unit manufacturer including:
   1. Refrigerant piping pressure test.
   2. Full evacuation.
   3. Refrigerant and oil charging.
   4. Completed operating log.
E. Lubricate all equipment prior to start-up
F. Demonstrate that all components function properly.

### 3.4 CLEANING

A. Clean exposed components of dirt, finger marks, and other disfigurements.

## 3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation of system to Owner's facility personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Briefly describe function, operation, and maintenance of each component.
B. Training: Train Owner's facility personnel on operation and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of two hours of training.

## 3.6 PROTECTION

A. Protect installed components from subsequent construction operations.
B. Replace exposed components broken or otherwise damaged beyond repair.

END OF SECTION

# SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Basic Electrical Requirements specifically applicable to Division 26 Sections, in addition to Division 1 - General Requirements.

### 1.2 WORK INCLUDED IN THE ELECTRICAL CONTRACT

A. The mention of any article, operation, material, or method requires that the Contractor shall provide same, of quality noted, in the quantity required, and shall perform each operation, in complete accordance with the conditions stated. The Contractor shall provide all material, labor, equipment and transportation as necessary to complete the project in conformity with the Contract Documents. In general, this work includes everything essential for a complete electrical system in operating order as shown or implied on the drawings or herein-after specified.

B. Contractor shall furnish all scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of all equipment and apparatus required to be installed by the Contractor. The Contractor upon completion of the project shall remove all equipment.

### 1.3 CONTRACTOR IDENTIFICATION

A. Wherever in this specification the word "Contractor" appears, either as word or part of a word, it is meant to refer to the Contractor or Subcontractor performing the required work of their respective Divisions.

B. Wherever in this specification the words "man", "men", or their related pronouns may appear, either as words or parts of words, they have been used for literary purposes and are meant in their generic sense to include all humankind - both female and male sexes.

C. Definitions:
   1. Provide: Furnish, install and wire complete and ready for service.
   2. Furnish: Responsible for purchasing item and also delivery to the jobsite.
   3. Install: Responsible for moving and mounting equipment to the final location.
   4. Wire: Responsible for final connections, ready for service.
   5. Exposed: Exposed to view in any room, corridor or stairway.
   6. This Contractor: The Electrical Contractor, also referred to as The Contractor.
   7. The Engineer: Ring & DuChateau, Inc. Wauwatosa, WI.
   8. Code: National, State and Local Electrical codes including OSHA requirements.
   9. The Owner's Representative: The individual who the Owner selects as his project representative.
   10. Equals: Manufacturers or methods listed by name in the specifications, on the drawings or in an addendum are considered to be equals.
   11. Substitution: Any manufacturer or method other than those listed by name in these specifications, on the drawings, or in an addendum.
   12. The Architect: Kahler Slater
   13. Owner: City of Wauwatosa

### 1.4 PERMITS, CODES, ORDINANCES, STANDARDS AND SALES TAX

A. Contractor shall obtain and pay for all necessary permits and licenses pertaining to this Division.

B. Contractor shall comply with National, State and local Codes, laws, ordinances and regulations. The requirements of the National Board of Fire Underwriters, OSHA or anything herein specified or shown on the drawings unless noted otherwise.
C. The Contractor shall pay all sales taxes as may be required.
D. Should any change in the plans and specifications be required to conform with the above, the Contractor shall notify the Architect/Engineer before submitting a Bid. After entering into a contract, the Contractor shall be required to complete all work necessary to meet the above requirements without extra expense to the Owner.
E. All materials shall have a U.L. label where a U.L. Standard and/or test exists.
F. All work shall be installed in accordance with the latest editions of NFPA 99 & 101.

## 1.5 DRAWINGS

A. The drawings depicting electric work are diagrammatic and show, in their approximate location, symbols representing electrical equipment and devices. The exact location of such equipment and devices shall be established in the field in accordance with instructions from the Architect.
B. Contractor shall furnish and install all such work, piping, structural supports, electrical wiring and conduit and any other additional equipment for a complete operational system.
C. Unless specifically stated to the contrary, no measurement of an electrical drawing by scale shall be used as a dimension. Dimensions noted on the electrical drawings are subject, in each case, to measurements of adjacent or previously completed work and all such measurements necessary shall be taken before undertaking any work dependent upon them.
D. In the event of a conflict between the drawings and specifications this Contractor shall base his bid on the greater quantity, cost or quality of the item in question, unless such conflict is resolved by an addendum.

## 1.6 MATERIALS AND EQUIPMENT

A. All materials and equipment required shall be new, and shall be installed per the manufacturer's recommendation.
B. All items specified shall be the latest type or model produced by the manufacturer specified. If descriptive specification or model number is obsolete, substitute current product.

## 1.7 APPROVALS

A. Contractor shall, within a maximum of 30 days of award of Contract, submit a complete list of all Subcontractors, equipment and material manufacturers whose products are proposed for the project under the conditions outlined in the specifications. Submittal of the Bill of Material shall be prior to ordering equipment.
B. The Engineer shall return one copy of the Bill of Material submitted with his comments indicated thereon or in accompanying letter of transmittal. Where items of equipment are indicated "rejected", the Contractor shall resubmit the name of alternative manufacturer for consideration.
C. It is hereby understood that review of the Bill of Material with "no exceptions taken" constitutes a review to place orders and does not relieve the Contractor from submitting shop drawings for review.
D. Intent to furnish exact items specified does not relieve the Contractor from submitting the above list.
E. 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 shall be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the drawings.

## 1.8 SUBSTITUTIONS

A. Contractor shall provide all supporting data and assume the "burden of proof" that any substitute proposed is equivalent as to appearance, construction, capacity and performance.

B. Where an item of equipment not shown on the drawings is accepted and the use of such equipment shall require any redesign of structure, foundations, utilities, piping, wiring or of any other part of the architectural, structural, mechanical, plumbing, sitework, or electrical work, the cost of all such redesign, drawings, detailing and accompanying additional costs of any item of work shall be paid for by the Contractor and such redesign shall be subject to the approval of the Architect/Engineer and all authorities having jurisdiction over the work.

C. In any case where the Contractor wishes to use equipment or methods other then those listed by name in the Contract Documents, such equipment shall be considered a substitution and must be approved by the Engineer. To gain approval of substitutions, the Contractor shall submit the following to the Engineer for his review.

1. Documentation from the equipment manufacturer indicating where this equipment meets and does not meet the specifications or drawings as written. This documentation shall be submitted in letter form and shall include the manufacturer's letterhead.
2. Manufacturer's cut sheets. (3 copies). Cut sheets shall be originals as are contained in the manufacturer's catalog. Cut sheets shall contain all pertinent information for determining equivalency. Photocopies of these sheets will not be accepted for review.
3. In the case of lighting fixtures, the Contractor shall submit photometric data compiled by an independent testing laboratory. Photometric data shall be provided in paper copy and in electronic form in IES format. Provide point by point and other calculations as requested by the Engineer. This data shall contain the independent testing laboratory's label and the manufacturer's letterhead.
4. If requested by the Engineer, the Contractor shall also provide samples of the proposed equipment for the Engineer's review.
5. Evidence shall be furnished in writing with substitution submittals that there is an efficient service organization which regularly carries a stock of repair parts for the proposed equipment and that the organization is conveniently located for prompt service.
6. In each case the Contractor shall furnish any other information or materials as considered necessary by the Architect/Engineer to establish equality.

D. The Contractor shall also affix his review and/or approval stamp to all documentation submitted indicating they are in order and equal to the items specified.

E. Without the above documentation, photometric data, original cut sheets and Contractor's stamp; the submittal will be rejected without review.

F. Any substitution submittals, including samples, shall be received in the Architect/Engineer's office a minimum of ten working days prior to the Bid due date to allow adequate time for review. No consideration will be given to requests for substitution approval not conforming to these requirements.

G. Materials, equipment, or methods of installation other than those named will be accepted only if such materials, equipment or methods are in accordance with the general requirements and are similar in composition, dimension, construction, capacity, finish and performance.

## 1.9 SHOP DRAWINGS

A. After receiving approval of proposed equipment and material submittals in accordance with "Approvals" above, submit shop drawings, certified by the original manufacturer, for each item of electrical equipment and appurtenances required for this project, as indicated below:

1. Short Circuit & Coordination Study.
2. Circuit Breakers.
3. Panelboards.
4. Transformers.
5. Disconnect Switches.
6. Transient Voltage Surge Suppression.
7. Lighting Fixtures.
8. Lighting Controls.
9. Occupancy Sensors.
10. Fire Alarm Systems.
11. Security Systems.

B. The Contractor shall affix his review and/or approval stamp to all documentation submitted indicating they are in order and equal to the items specified. The Engineer will reject all shop drawings that lack the Contractor's review and/or approval stamp. The Engineer shall also reject all shop drawings not reviewed by the Contractor.

C. Shop drawings submitted to the Architect/Engineer for review does not constitute notification of substitution unless specific changes are brought to the attention of the Architect/Engineer.

D. Submit the quantities of shop drawings as requested by the Architect/Engineer.

E. Review of shop drawings shall not be considered as a guarantee of measurements of building conditions.

F. Engineer's review of Shop Drawings shall not relieve Contractor from the responsibility for any variation from the requirements of the Contract Documents.

G. The Contractor shall submit dimensional drawings for all electrical equipment rooms, requiring working clearances.

H. Failure to submit shop drawings in ample time for review shall not entitle the Contractor to an extension of contract time, and no claim for extension by reason of such default shall be allowed.

I. Physical dimensions of shop drawings submitted for review shall not exceed 8-1/2" X 11" unless impossible to illustrate data properly without using a larger sheet.

J. If more than one type of lighting fixture (or other materials) is on a submitted sheet, the Electrical Contractor shall conspicuously check the item submitted with a red pen.

K. The shop drawings shall reference all equipment designation on the drawings, such as panelboard designations. For equipment without designation, utilize the designation of the load, such as Motor #1 for a motor starter.

L. No materials or equipment subject to prior review by the Engineer shall be fabricated or installed by the Contractor, without such review and approval.

M. The use of the construction drawings as shop drawings is not acceptable.

N. All fluorescent dimming ballasts and fluorescent dimming controls shall be submitted simultaneously, and preferably as a single shop drawing submittal. The shop drawings will be rejected if this requirement is not met.

O. See other sections of this specification for additional requirements.

## 1.10 DRAWINGS FOR REVIEW

A. The Contractor shall provide the following drawings at the request of the Engineer or if the Contractor proposes an alternate layout for an electrical/telecommunications room or closet.

B. Provide a 1/4" scaled floor plan of:
   1. Electrical equipment rooms/closets
   2. Electrical systems/communications rooms/closets
   3. Where telecommunications wiring is by the Electrical Contractor:
      a. Detailed layout of each telecommunications rooms/closets.
      b. Detailed front and rear elevations of each equipment rack(s) install or modified as part of this project.

C. The drawings shall depict actual room and equipment dimensions, specifically noting the clearance dimensions.

D. The scaled floor plan shall indicate the locations of all electrical distribution equipment along with all other electrical or communications equipment located in the room but not limited to the following”
   1. Paging and miscellaneous sound system equipment.
   2. Fire alarm equipment.
   3. Security equipment.

## 1.11 PROJECT MODIFICATIONS

A. Contractor shall submit in writing any requests for modifications to the final drawings and specifications.
B. Documentation depicting modifications that are submitted to the Architect/Engineer for review shall indicate specific changes that are being suggested.

## 1.12 EXAMINATION OF SITE AND SPECIAL SITE CONDITIONS

A. Before submitting proposals for the work, the Contractor shall have examined the site and be satisfied with the existing conditions under which the work shall be accomplished.
B. No additional compensation shall be allowed the Contractor due to failure to make the above examination or neglect to include all materials and labor required to complete the work.

## 1.13 STORAGE OF EQUIPMENT AND MATERIALS

A. Materials shall be stored to insure the preservation of their quality and fitness for the project.
B. When considered necessary, the equipment and materials shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground, and they shall be placed under cover.
C. Stored materials shall be located to facilitate prompt inspection.
D. Equipment and materials shall be stored in approved locations and in a manner to prevent overloading of the building structure.

## 1.14 CHASES AND RECESSES

A. Contractor shall provide chases and recesses required for the work of this Contract.
B. Coordinate the location of the chases and recesses with all other trades whose work is involved.

## 1.15 SLEEVES

A. Fire and/or Smoke Rated Walls: Refer to architectural drawings for location and rating of walls. Where cables not in conduit penetrate rated walls, provide a UL listed assembly. Refer to section 2.2 for additional requirements.
B. Non-Fire Rated Interior Walls: Sleeves through walls that extend from floor to structural ceiling provide a metal conduit sleeve extending a minimum of 2 inches beyond the wall. The sleeve shall be fill voids with a sound-batt insulation.
C. Exterior Walls: Refer to section 26 05 31.
D. Floors
   1. Where conduits penetrate rated floors, provide a UL listed assembly or method utilizing a sleeve. Sleeve shall extend a minimum of 4 inches above the floor. Refer to architectural drawings for rating of floors.
   2. Where cables not in conduit penetrate rated floors, provide a UL listed assembly or method utilizing a sleeve. Sleeve shall extend a minimum of 4 inches above the floor. Sleeve shall be sized for 25% spare capacity. Refer to architectural drawings for rating of floors.

E. All sleeves shall be sized for 25% spare capacity.

## 1.16 CUTTING AND PATCHING

A. All cutting and patching that is necessary for the installation of the work of this Contract shall be provided by this Contractor under the direction and to the satisfaction of the Architect/Engineer unless this work is specified to be the work of the Contractors of other Divisions.
B. No cutting of structural work shall be done without the written consent of the Architect/Engineer being previously obtained in each case, and all such work shall be done in accordance with the Owner's Representative's directions and supervision.
C. All patching shall match adjacent surfaces.
D. Contractor shall, before starting work in areas which requires significant cutting and patching, inspect and take note of existing conditions along with the Architect/Engineer to avoid later disputes with regard to the condition of the existing surface before work began.

## 1.17 WATERPROOFING

A. Where any work penetrates waterproofed surfaces including roofs, foundations, walls, etc., the Architect/Engineer shall approve the method of installation before the work is started.
B. Contractor shall furnish all necessary sleeves, caulking and flashing as required to make the installation of the work watertight.

## 1.18 COOPERATION WITH OTHER TRADES

A. Contractor shall give full cooperation to other trades and furnish any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference and/or delays.
B. If the Contractor installs work before coordinating it with other trades, or so as to cause interference with work of other trades, the Contractor shall make necessary changes in the work to correct the condition without extra charges.

## 1.19 JURISDICTION OF WORK

A. All work specified or shown for this Division of the work shall be part of this Contract.
B. The event of jurisdiction (as to whether the work shall be installed by another trade) shall not release the work from this Contract.
C. In such occurrence, the original Contractor shall sublet the work to the trade having jurisdiction.
D. The Contractor having jurisdiction shall then be responsible to complete the work in accordance with these drawings and specifications and to the original Contractor of this Division of the work.

## 1.20 SUPERVISION OF WORK

A. Contractor shall furnish the service of an experienced Superintendent who shall be constantly in charge of the installation of the work together with all Contractors, skilled workman, helpers and laborers required to unload, transfer, erect, install, connect, adjust, start, operate and test each system.
B. The Superintendent shall be thoroughly acquainted with and be responsible for the various Contractors' work so that it is properly coordinated and supervised to the satisfaction of the Architect/Engineer.

## 1.21 DEFECTS

A. Should the Engineer find any portion of the electrical system installed under this Contract that fails to comply with the Contract Documents, the Contractor shall replace the defects or imperfections at the Contractor's expense. All other work disturbed by the correction of defects or imperfections shall also be corrected at the Contractor's expense.

## 1.22 PROTECTION OF FINISHED WORK

A. Contractor shall maintain adequate protection of all contracted work and materials, located either on or off of the site of the project. Contractor shall protect the work and materials of all other Contractors and the Owner's property from damage arising from work under this Contract.
B. All damages resulting from neglect or refusal of the Contractor to protect such work, materials and property during erection, construction and completion of the project shall be the responsibility of the Contractor.
C. All costs associated with the repair and/or replacement of the damaged work shall be borne by the Contractor responsible for the damage. All repaired and/or replaced work shall be completed to the satisfaction of the Architect/Engineer.

## 1.23 DAMAGE TO OTHER WORK

A. Contractor shall be held responsible for all damage to other work caused by the work or through the neglect of the Contractor's employees.
B. The Electrical Contractor shall pay all costs for patching and repairing of damaged work and the work shall be performed by the Contractor who installed the work.

## 1.24 USE OF SYSTEM

A. The use or operation of new work, or any part thereof, even with the consent of the Owner's Representative, shall not be construed to be acceptance of the work, nor shall it be construed to obligate the Owner to accept improper work or defective material.

## 1.25 CLEANING PAINTING AND FINISHING

A. During the progress of the work and when directed by the Architect/Engineer, the Contractor shall remove from the building site rubbish, dirt and other debris caused by performance of the work.
B. The Contractor shall clean all exposed work, the interior and exterior of cabinets and pull boxes, etc., and remove all rubbish and debris resulting from the work.
C. Where painted surfaces of equipment have been damaged or rusted during construction, the Contractor shall paint same to match final.

## 1.26 TESTS AND ACCEPTANCE

A. The operation of the equipment and electrical systems does not constitute an acceptance of the work by the Owner. The final acceptance is to be made after the Contractor has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.
B. If any device, equipment or wiring fails the testing specified herein, that item(s) shall be replaced or repaired as directed by the Engineer.
C. Upon completion of the installation, the Contractor shall furnish certificates of approval from all authorities having jurisdiction. He shall demonstrate that all work is complete and in perfect operating condition, with raceway and conduit system properly grounded, all wiring free from grounds, shorts, and that the entire installation is free from any physical defects. In the presence of the Engineer and the Owner, the Contractor shall demonstrate the proper operation of all miscellaneous systems.

D. Contractor shall provide 4 hours for demonstration and training the Owner of the basic operation installation and maintenance of the electrical systems.

## 1.27 RECORD DRAWINGS

A. The Contractor shall keep a detailed up-to-date record of the following items:
   1. Feeder conduit routing.
   2. Dimensioned drawings indicating all conduits in the slab.
   3. Approximate junction box and branch conduit locations.
   4. Actual circuit numbers, the equipment and devices are connected to.

B. Record drawings shall be maintained throughout the duration of the project and shall reflect all pertinent information. At the time of project completion, the EC shall provide a bond copy and CD ROM copy of the following to the Owner's representative and engineer:
   1. A complete set of original contractor field mark up record drawings in color scanned PDF format, and bond copy prints.
   2. A complete set of contractor edited, AutoCAD (.DWG format) or Revit (.RVT format) generated PDF format copies of all project sheets, and bond copy prints.
   3. AutoCAD (.DWG format) or Revit (.RVT format) files associated with the record drawings.

C. See General Requirements - Division 1, for additional information concerning record documents.

## 1.28 TEMPORARY ELECTRICAL SERVICE

A. Refer to General Requirements and Division 1.

B. Temporary power service shall be either from a separate utility service, or may be connected to the building distribution system if this load is served via an isolation transformer which is provided with a secondary ground fault protected overcurrent device. Contact the building owner for potential temporary service connection points before commencing with the temporary service installation.

## 1.29 GUARANTEES AND WARRANTIES

A. Contractor shall guarantee, in writing, that:
   1. All work installed shall be free from any and all defects in workmanship and materials.
   2. All apparatus shall develop capacities and characteristics specified.
   3. During the period of one year, or as otherwise specified, from date of substantial completion, any defects in workmanship, material or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within a reasonable time as specified in notice from the Owner's Representative.

B. Refer to General Requirements and Division 01.

C. In default thereof, the Owner's Representative shall have the work done and charge the cost of the work to the Contractor.

D. Contractor shall guarantee that items furnished shall have capacities equal to, or greater than, those specified.

E. Furnish manufacturer's written warranties for all equipment and cabling systems (ie-Commscope Systimax, Panduit PanGen, etc.), stating effective date of Warranty to the Owner's Representative.

## 1.30 WORK BY OWNER

A. Not applicable.

## 1.31 OWNER FURNISHED PRODUCTS

A. Not applicable
B.

## 1.32 ALLOWANCES

A. See General Requirements or Division 01 for allowance information.

## 1.33 UNIT PRICES

A. See Division 01 or bidding requirements for unit pricing information.

## 1.34 ALTERNATES

A. See Division 01 or bidding requirements for applicable alternate bidding information.

# PART 2 PRODUCTS

## 2.1 ACCESS PANELS

A. Manufacturers:
   1. Milcor.
   2. Knapp.
   3. Zurn.
B. Size: adequate size to permit adjustment or service of concealed devices.
C. Design:
   1. Suitable for installation in the material forming the finished surface.
   2. Flush metal frame.
   3. Flush hinged steel door with flush latch.
   4. Latches:
      a. Screwdriver operated.
      b. Key operated cylinder lock.
      c. Non-key special tamperproof design.
D. UL listed to conform to the fire rating of the surface it is installed in.
E. Panels in acoustic ceiling shall be recessed type, to which tile can be attached flush with the ceiling tile.

## 2.2 FIRESTOP MATERIALS

A. Sealants
   1. Manufacturers:
      a. 3M.
      b. Hilti.
      c. Insta-Foam Products.
      d. Bio Fireshield.
      e. Metacaulk.
      f. Verify with Construction Manager if all contractors shall utilize a single manufacturer of firestop products. Include the cost of that manufacturer in bid.
   2. One-part, intumescent elastomer, UL classified, non-corrosive to metal, and compatible with synthetic cable jackets.
   3. Material shall expand up to 10 times when exposed to flame or heat.
   4. Maximum flame spread and fuel contributed of 25 and smoke development of 50 when tested in accordance with ASTM E84.
B. Assemblies
   1. Manufacturers:
      a. Specified Technologies, Inc.
      b. Prior approved equal.

2. Device shall:
   a. Contain a fire and smoke sealing system that automatically adjusts to the addition or removal of cables.
   b. Contain an internal and external firestopping as required for the fire rating of the wall.
   c. Shall require no maintenance and shall accommodate future cable changes without mechanical adjustment and/or removal or replacement of protective materials.
3. Be equivalent to E-Z Path Series.

## PART 3 EXECUTION

### 3.1 ACCESS PANELS

A. Provide access panels for access to equipment, junction and/or pull boxes or other specialties installed behind wall or above ceiling surfaces.
B. Lay-in tee bar ceilings and snap-in removable metal pan ceilings shall be considered adequate for access.
C. Sublet installation work to subcontractors specifically skilled in the construction of the surfaces involved.
D. Confer with the other Project Contractors with respect to access panel locations and wherever practicable, group devices in such a manner so as to eliminate as many panels as possible.
E. Remove all markings and labels from access panels.
F. Provide screwdriver operated latches for all access panels except the following specific exclusions:
   1. Public or Secure Areas shall be key operated.
   2. Hourly Rated Surfaces shall be as required by UL.

### 3.2 FIRESTOP MATERIALS

A. Penetrations through fire and/or smoke rated construction shall be sealed to maintain the rating of the construction in which they occur, and shall be UL listed for the rating of the barrier penetrated and the construction type utilized in that barrier.
B. Utilize firestop materials types as scheduled below:
   1. Conduit through-penetration of rated walls: Putty.
   2. Conduit through-penetration of rated floors: Putty or mortar.
   3. Cable tray through-penetration of rated walls: Bags or pillows.
   4. Cable penetration of rated walls:
      a. Conduit sleeve with firestop plug.
   5. Junction box membrane-penetration of rated walls: Putty pads.
C. Comply with the manufacturer's requirements for proper installation of firestop materials to obtain the required fire and/or smoke rating.

END OF SECTION

# SECTION 26 05 02 - ELECTRICAL DEMOLITION FOR REMODELING

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Electrical demolition.

### 1.2 SYSTEM DESCRIPTION

A. The purpose of the electrical demolition drawings is to provide the general scope of the electrical demolition required for the project. The electrical demolition drawings may not indicate every lighting fixture, wiring device, panelboard, junction box and etc.
B. The contractor shall include all costs associated with the removal and/or relocation of any electrical item, even if not indicated on the electrical demolition drawings, to facilitate the proposed construction.

### 1.3 REFERENCES

Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. None required.

### 1.5 EQUIPMENT DIMENSIONS

A. None required.

### 1.6 EXTRA MATERIALS

A. None required.

### 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual Sections.

## PART 3 EXECUTION

### 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. None required.

### 3.2 EXAMINATION AND PREPARATION

A. Verify field measurements and circuiting arrangements are as shown on Drawings.
B. Verify that abandoned wiring and equipment serve only abandoned facilities.
C. Demolition Drawings are based on the best available information at the time of design. Report discrepancies to Architect/Engineer before disturbing existing installation.
D. All materials identified to be salvaged or reused shall be inspected by the Contractor prior to removal. The Contractor shall provide a list of damaged equipment to the Architect/Engineer.
E. Beginning of demolition means contractor accepts existing conditions.
F. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
G. Coordinate utility service outages with Utility Company.
H. Provide temporary wiring and connections to maintain existing systems in service during construction.
I. After completion of demolition, provide permanent wiring and connections to maintain existing systems in service.
J. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and local fire department at least 5 working days before partially or completely disabling system. Minimize outage duration.

## 3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Demolish and extend existing electrical work under provisions of Section 26 05 00 and this Section.
B. Remove, relocate, and extend existing installations to accommodate new construction.
C. Remove abandoned wiring to source of supply.
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 outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
F. Disconnect and remove abandoned panelboards and distribution equipment.
G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
I. Repair adjacent construction and finishes which were damaged during demolition and extension work to match existing conditions.
J. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
K. Existing electrical equipment, devices, raceways, etc. which are required to remain but are affected because of the proposed renovation shall be revised/relocated to accommodate the new construction.
L. Extend existing installations using materials and methods as specified.
M. Where conduits penetrate below grade walls, they shall be removed as far as possible, sealed and/or capped to maintain the water integrity of the building envelope.
N. Existing branch conduits may be reused if the conduit meets all current codes regarding wire fill, supporting means etc.
O. In renovated areas where existing ceilings are being removed and new ceilings are being installed, the electrical contractor shall be responsible for resupporting all existing conduits, boxes, etc. required to remain, per the these specifications and all applicable codes.
P. In renovated areas where new non-accessible ceilings are being installed, the contractor shall have the option of removing or relocating existing junction boxes, conduit and conductors that will be inaccessible or providing access panels for the existing junction boxes.

## 3.4 SALVAGEABLE EQUIPMENT

A. The Contractor shall dispose of all obsolete material except as specified herein.

## 3.5 BALLAST DISPOSAL

A. The Contractor shall inspect all ballasts in all light fixtures removed as part of this project and take the actions described below.
B. All ballasts labeled as "NON-PCBs" or "NO PCBs" shall be handled as described in this section. If the PCB content is not stated on the ballast label, the ballast shall be handled as a PCB ballast.
C. All PCB ballasts shall have the wires clipped off and the ballasts placed in governmental approved enclosures (drums) and placed in storage in a location within the building as directed by the Owner. The quantity and size of the enclosures (drums) shall be determined by the Contractor. Enclosures (drums) will be provided by the owner. The Contractor shall provide the Owner in written form, a total count of the PCB ballasts.
D. The ballasts are not to be removed from the work site by the Contractor. To do so, would be a violation of governmental hazardous waste regulations.
E. The Contractor shall label and mark the PCB storage enclosures with approved PCB labels and the storage area with signs, marks and lines to meet the regulations of the governing authorities.
F. The Contractor shall also provide approve PCB absorbent materials to be stored immediately adjacent to the drum storage area. Do not place loose absorbent material in the drum.
G. When the ballast demolition is completed and all the PCB ballasts are placed in drums ready to be picked up for disposal, the Contractor shall notify the Owner. The Owner shall make arrangements for pickup and disposal of the PCB ballasts, including the cost of disposal.

## 3.6 LAMP DISPOSAL

A. The Contractor shall remove all lamps from all luminaires being removed or relocated. The lamps shall be removed intact. The Contractor shall be responsible for any additional charges for broken lamps.
B. The Contractor shall store the lamps in drums or boxes and place in storage in a location within the building as directed by the Owner. The Contractor shall provide the containers. The lamps shall be sorted by type.
   1. Fluorescent
      a. Compact, PL or biax lamps
      b. U shaped lamps
      c. Circline lamps
      d. 2', 3', 4' and 8' straight lamps.
   2. Mercury Vapor
   3. High Pressure Sodium
   4. Low Pressure Sodium
   5. Metal Halide
   6. Incandescent
C. Broken lamps shall be stored in a heavy plastic bag and the bag put into a rigid container. The broken lamps shall be sorted as described above.
D. The Contractor shall provide to the Owner, in written form, a total count of all lamp types, including broken lamps.
E. These lamps are not to be removed from the site by the Contractor. To do so, would be a violation of governmental hazardous waste regulations.
F. When the lamp demolition is complete and all lamps are placed in the containers ready to be picked up for disposal, the Contractor shall notify the Owner. The Owner shall make arrangements for pickup and disposal of the lamps, including the cost of disposal.

## 3.7 HAZARDOUS SUBSTANCES

A. Ionization smoke detectors: The contractor shall include all the costs associated with disposal of the non-salvaged ionization smoke detectors. Typically, the detectors can be returned to their original manufacturer for disposal of the radioactive element.
B. Self-luminous exit lights: The contractor shall include all the costs associated with disposal of the non-salvaged self-luminous. Typically, the exit signs can be returned to their original manufacturer for disposal of the radioactive element.
C. PCB-Liquid filled transformers.
   1. Asbestos insulated wire.
   2. Oil immersed equipment.
   3. Other.

## 3.8 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.

## 3.9 INSTALLATION

A. Install relocated materials and equipment under the provisions of the associated specification section(s) for new equipment as if the relocated equipment is new equipment. Example: Relocated luminaries shall be installed per specification section 26 50 00.

## 3.10 FIELD QUALITY CONTROL

A. Verify all electrical equipment that is shown on the drawings to be demolished and all associated electrical serving it has been removed.

## 3.11 ADJUSTMENT AND CLEANING

A. Verify all connections are tightened to the proper torque as recommended by the manufacturer.

## 3.12 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.13 DEMONSTRATION AND TRAINING

A. None required.

END OF SECTION

# SECTION 26 05 03 - ELECTRICAL EQUIPMENT MOUNTING REQUIREMENTS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Electrical equipment mounting height requirements applicable to all Division 26, 27 and 28 sections.

### 1.2 SYSTEM DESCRIPTION

A. The section provides the standard mounting heights for electrical equipment. Any mounting heights on the architectural or electrical drawings supersede the mounting heights in this section.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For Approval
   1. None required
B. For Record Purposes
   1. None required.
C. Operations and Maintenance Manuals
   1. None required.

### 1.5 EQUIPMENT DIMENSIONS

A. None required.

### 1.6 EXTRA MATERIALS

A. Spare Materials
   1. None required.
B. Maintenance Materials
   1. None required.

### 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2 PRODUCTS

Not Used.

## PART 3 EXECUTION

### 3.1 MOUNTING HEIGHTS

A. General

1. All mounting heights are to the centerline of the item unless noted otherwise.
2. All equipment installed in this project shall be mounted per the American Disabilities Act (ADA) requirements.

B. Wiring Devices
1. Switches and Switch/Receptacle Combinations: 46 inches above finished floor.
2. Receptacles:
   a. Standard locations: 18 inches above finished floor, unless specifically noted otherwise on floor plans.
   b. Above countertops: Vertically mounted, 46 inches above finished floor.

C. Telecommunication Outlets
1. Standard locations: 18 inches above finished floor, unless specifically noted otherwise on the plans.
2. Above countertops: 46 inches above finished floor.
3. Wall mount: 46 inches above finished floor.

D. Low Voltage Switching Equipment
1. Switches: 46 inches above finished floor.
2. Relay panels: 72 inches above finished floor to top of enclosure.

E. Disconnect Switches, Enclosed Circuit Breakers and Elevator Distribution Equipment
1. Disconnect switches, enclosed circuit breakers and elevator distribution equipment: 72 inches above finished floor to top of enclosure.

F. Panelboards
1. Panelboards: 84 inches above finished floor to top of enclosure; install panelboards taller than 84 inches with bottom of the enclosure, 4 inches above floor.

G. Motor Controllers
1. Motor controllers: 60 inches above finished floor to top of enclosure.

H. Contactors
1. Contactors: 60 inches above finished floor to top of enclosure.

I. Interior Luminaires
1. Fixtures to be mounted at 80" minimum above finished floor to bottom of fixture:
   a. Wall mounted luminaires protruding greater than 4" from wall.
   b. Pendant mounted fixtures located above walkways.
2. See electrical and architectural drawings for additional information further defining mounting height requirements.

J. Fire Alarm System
1. Pull stations: 46 inches above finished floor.
2. Alarm indicating device: 80" above finished floor to bottom of device or 6" below finished ceiling to top of device, whichever is lower.
3. Control panel: 72 inches above finished floor to top of enclosure.
4. Remote annunciator: 60 inches above finished floor to top of enclosure.

K. Security Systems
1. Card Readers and key pads: 46 inches above finished floor.
2. Control panels: 72 inches above finished floor to top of enclosure.

END OF SECTION

# SECTION 26 05 21 - BUILDING WIRE AND CABLE

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Building wire and cable.
B. Wiring connectors and connections.

### 1.2 SYSTEM DESCRIPTION

A. Provide the building wire and cabling as indicated on the drawings and specified herein.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For Approval
   1. As requested by the Engineer, provide a field sample of each size and type cable utilized on this project. Minimum length: 2 feet. This cable shall be an actual sample cut from cable that has been delivered to the job site.
B. For Record Purposes
   1. Accurately record actual sizes, quantity and locations of wire and cables.
C. Operations and Maintenance Manuals
   1. None required.

### 1.5 EQUIPMENT DIMENSIONS

A. None required.

### 1.6 EXTRA MATERIALS

A. Spare Materials
   1. None required.
B. Maintenance Materials
   1. None required.

### 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2 PRODUCTS

### 2.1 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated wire.
B. Conductors:
   1. Copper – Copper conductors are acceptable for all branch circuits and feeders.
C. Insulation Voltage Rating: 600 volts, 90 degree Celsius.
D. Insulation

1. Interior, Exterior Above or Below Grade: ANSI/NFPA 70; Type THHN/THWN-2 or Type XHHW-2.
2. Interior and served from Isolated Power Systems: ANSI/NFPA 70; XLP Type XHHW-2 insulation. Insulation thickness shall not be less than 1/32" for #10 and #12 AWG and 5/64" for #8 AWG or larger. The dielectric constant of the conductor shall be 3.5 or less.
3. Flexible for Interior or Exterior: ANSI/NFPA 70; Type RHH/RHW-2 insulation.

E. Color coding: Insulation for all conductor sizes shall be colored. Color coding as specified in 26 05 53.

## 2.2 COMMUNICATIONS CABLES

A. Communications cables shall be the type as called for in the specifications and drawings for the installation of various communications systems.
B. Communications cables installed in cable trays shall be approved for use in cable tray and shall be of fire resistive construction.
C. Cables routed exposed through return air ceiling plenums shall be smoke resistance Teflon coated cable classified as type CLP or CMP communications cable.

## 2.3 WIRING CONNECTORS

A. Conductors #10 AWG and smaller: Ideal Twister compression type solderless connectors with plastic cover or equivalent. WAGO compact splicing connector with operating lever and transparent housing or equivalent.
B. Splices and taps in conductors #8 AWG and larger: Solderless compression type connectors, tool and die applied, of a type that not loosen under vibration or normal strains. Burndy "Hy-Dent" type or equivalent.
C. For exterior applications,
   1. In above ground appplications: Ideal Weatherproof wire connector, compression type solderless connector with plastic cover and silicone based sealant to protect splice from moisture and corrosion.
   2. In below grade applications: NSi Industries Easy-Splice Gel Splice kits or equivalent.

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Store and protect in accordance with manufacturer's instructions.
B. Cable must be stored in a location protected from vandalism and weather.
C. Cable stored outside must be covered with opaque plastic or canvas with provision for ventilation to prevent condensation and for protection from weather. If air temperature at cable storage location will be below 40 degrees F., the cable shall be moved to a heated (50 degrees F minimum) location. If necessary, cable will (shall ? ) be stored off site at the Contractor's expense.

## 3.2 EXAMINATION AND PREPARATION

A. Verify that interior of building has been protected from weather.
B. Verify that mechanical work likely to damage wire and cable has been completed.
C. Completely and thoroughly swab raceway before installing wire.

## 3.3 INSTALLATION

A. General Installation
   1. Identify wire and cable under provisions of Section 26 05 53.

2. Identify each conductor with its circuit number or other designation indicated on Drawings.
3. Install products in accordance with manufacturer's instructions and NECA "Standard of Installation".
4. Use stranded conductors for control circuits and for wiring served by isolated power systems.
5. Use highly stranded cable for feeders and branch circuits that call for flexible cable on the one line diagram.
6. Use conductor not smaller than 12 AWG for power and lighting circuits.
7. Use conductor not smaller than 16 AWG for control circuits.
8. Voltage drop for branch circuit and feeder circuit combined shall not exceed the requirements of NEC Article 215.
9. Install conductors only when raceway system is complete and building is enclosed and watertight. Pull all conductors into raceway at same time.
10. Route a continuous insulated equipment grounding conductor with all feeder and branch circuits.
11. Route branch circuits and switch legs as dictated by construction, these specifications, or instructions from the Engineer.
12. Use suitable wire pulling lubricant for building wire. Conductors served via isolated power systems shall be installed using a dry lubricant which will exhibit a low dielectric constant, to minimize leakage current.
13. Protect exposed cable from damage.
14. Use suitable cable fittings and connectors.
15. Neatly train and lace wiring inside boxes, equipment, and panelboards.
16. Clean conductor surfaces before installing lugs and connectors.
17. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
18. Circuit numbers shown on the drawings are for the Contractor's estimating purposes and to plan his wiring. Exact circuit numbers shall be selected by the Contractor at his option to provide a balanced load on all phases at panelboards. Panelboard average load shall not differ from phase to phase by ±7-1/2%
19. Provide cable riser clamp in vertical raceways where required by code. All riser clamps shall be accessible for inspection.
20. Cables within switchgear shall be routed in a manner which will allow adequate room for bending and terminating cables. Cables must be secured in a manner which will not result in cable weight being placed on the termination electrical joint. Cable support shall be made in a manner that does not force cable against ground metal or which compresses cable diameter.
21. Use suitable reducing connectors or mechanical connector adapters for connecting existing aluminum conductors to copper conductors.

B. Home Run Installation
1. Use 10 AWG conductors for 20 ampere, 120 volt branch circuit home runs longer than 75 feet.
2. Use 8 AWG conductors for 20 ampere, 120 volt branch circuit home runs longer than 125 feet.
3. Use 10 AWG conductors for 20 ampere, 277 volt branch circuit home runs longer than 150 feet.
4. All branch circuit home run conductors greater than 200 feet, regardless of voltage, shall be sized for a maximum voltage drop of 3%. Home runs are defined for voltage drop purposes as the conductor distance from the panelboard to the first outlet of the network.

C. Feeder Installation
1. Feeder conduits shall not be installed in poured in place concrete.
2. Feeders shall follow the most accessible routes, concealed in construction in finished areas, exposed to the minimum temperature gradient and to minimum temperature fluctuation. Confine feeders to insulated portions of the building, unless otherwise shown.

3. Parallel Feeders
    a. Where multiple raceways are used for a single feeder, each raceway shall contain a conductor of each phase and neutral if used, and grounding conductor, if specified.
    b. Where feeder conductors are run in parallel, conductors shall be of same length, same material, circular-mil area, insulation type, and terminated in same manner.
    c. Where parallel feeder conductors are run in separate raceways, raceways shall have same physical characteristics.
4. Each raceway shall contain only those conductors comprising a single feeder circuit.

D. Neutral Conductor Installation
1. The use of single-phase, multi-wire branch circuits with a common neutral is not permitted. All branch circuits shall be furnished and installed with an individual accompanying neutral, sized the same as the phase conductors.

## 3.4 FIELD QUALITY CONTROL

A. Inspect wire for physical damage and proper connection.
B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values. If manufacturer’s torque values are not indicated, use the values specified in UL 486A-486B for the application.
C. Verify continuity of each branch circuit conductor.

## 3.5 ADJUSTMENT AND CLEANING

A. Verify all connections are tightened to the proper torque as recommended by the manufacturer.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.7 DEMONSTRATION AND TRAINING

A. None required.

END OF SECTION

# SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Grounding Electrode.
B. Grounding Electrode Conductors.
C. Grounding Bus Bars.
D. Equipment Grounding Conductors.
E. Neutral Grounding.

### 1.2 SYSTEM DESCRIPTION

A. GROUNDING ELECTRODE SYTEM
   1. Existing Metal underground water pipe.
   2. Metal frame of the building.
   3. Rod electrode.
B. PERFORMANCE REQUIREMENTS
   1. Grounding Electrode System Resistance 5 ohms.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For Approval
   1. None required.
B. For Record Purposes
   1. Accurately record location and sizes of all grounding electrodes.
   2. Accurately record actual size, quantity, and locations of all grounding electrode conductors.
C. Operations and Maintenance Manuals
   1. None required.

### 1.5 EQUIPMENT DIMENSIONS

A. None required.

### 1.6 EXTRA MATERIALS

A. Spare Materials
   1. None required.
B. Maintenance Materials
   1. None required.

### 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2 PRODUCTS

### 2.1 GROUNDING ELECTRODES

A. Rod Electrode
   1. Material: Copper-clad steel.
   2. Diameter: 3/4 inch.
   3. Length: 10 feet.

## 2.2 GROUNDING CONDUCTORS

A. Conductors
   1. Material: Standard copper.
   2. Size as shown on drawings or as required by the NEC Article 250.
   3. Grounding Electrode Conductors shall have a minimum size of #6 AWG.
   4. Refer to section 26 05 21 for additional conductor requirements.

## 2.3 GROUNDING BUS BARS

A. Type A – Suitable for use in Intermediate Telecommunications Rooms
   1. Wall mounted copper bus bar with polyester resin fiberglass insulators and steel structural supports. Bus bar shall be insulated from supports.
   2. Bus bar shall be 12” long minimum.
   3. Provide assembly with lug kit consisting of the following:
      a. (6) Compression lugs for #6 AWG conductors.
      b. (1) Compression lug for #2 AWG conductor.
      c. (1) Compression lug for #1/0 AWG conductor.
      d. (1) Compression lug for #2/0 AWG conductor.
      e. (1) Compression lug for #3/0 AWG conductor.
      f. Provide additional lugs as required for additional grounding conductors.
   4. Bus bar shall be B-line SBTGBK or equal.
B. Type B – Suitable for use in Electrical Equipment Rooms and Main Telecommunications Rooms.
   1. Wall mounted copper bus bar with polyester resin fiberglass insulators and steel structural supports. Bus bar shall be insulated from supports.
   2. Bus bar shall be 20” long.
   3. Provide assembly with lug kit consisting of the following:
      a. (6) Compression lugs for #6 AWG conductors.
      b. (1) Compression lug for #2 AWG conductor.
      c. (1) Compression lug for #1/0 AWG conductor.
      d. (1) Compression lug for #2/0 AWG conductor.
      e. (1) Compression lug for #3/0 AWG conductor.
      f. Provide additional lugs as required for additional grounding conductors.
   4. Bus bar shall be B-Line SBTMGB20K or equal.

## 2.4 CONNECTIONS

A. Mechanical Connectors
   1. Ground clamp fittings shall be interlocking clamp type fabricated from high strength corrosion-resistant metal with high strength silicon bronze U-bolt, nut, and lock washers.
   2. Irreversible compression-type connectors are acceptable for splice fittings, and if used shall be Burndy Hy ground or equivalent.
B. Exothermic connections are acceptable for splice fittings, and if used shall be Cadweld or equivalent.

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Accept material on site. Inspect for damage.

## 3.2 EXAMINATION AND PREPARATION

A. Verify that final backfill, and compaction has been completed before driving rod electrodes.

## 3.3 INSTALLATION

A. GENERAL
   1. Install products in accordance with manufacturer's instructions.
   2. Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.
   3. Attach grounds permanently before permanent building service is energized.

B. GROUNDING ELECTRODE
   1. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specific resistance to ground. Drive ground rod to a depth of 4 inches below finish grade.
   2. Water piping system ground shall be augmented by 2 NEC approved grounding electrodes to achieve an effective ground resistance as required by code and as shown on the plans. Building steel shall be used where available.
   3. Cable connections and joints shall be thermos-welded.

C. GROUNDING ELECTRODE CONDUCTORS
   1. Attach Grounding Electrode Conductor to point ahead of water meter or service shut off valve.
      a. Install bonding jumper around water meter.
      b. Install in rigid metal conduit securely fasten to pipe.
      c. Attach non ferrous metal tag to warn against removal.
      d. Bond metallic conduits, supports, cabinets, and other equipment so ground will be electrically continuous from service to outlet boxes.
      e. Grounding Electrode Conductor shall be permitted to be attached to other Grounding Electrodes where available in the building as defined in NEC Article 250 81 in lieu off attaching to water service.
   2. The Grounding Electrode Conductor shall be installed continuous and without splice from nearest building rounding Electrode to service equipment.
   3. Cable connections and joints shall be thermo-welded.
   4. Connections shall be accessible for inspection and checking. No insulation shall be installed over new Grounding Electrode Conductor connections.
   5. Install Grounding Electrode Conductors to permit shortest and most direct path from equipment to ground. When conductor runs through metallic conduit, bond to conduit at entrance and exit with bolted clamp.

D. EQUIPMENT GROUNDING CONDUCTORS
   1. Install Equipment Grounding Conductor within each feeder and branch circuit raceway. Conductor shall be bonded at each end on suitable lug, bus, or bushing.
   2. Install Equipment Grounding Conductor in nonmetallic and flexible conduit to complete equipment ground continuity. Ground wire shall be bonded at equipment and at first junction box of conduit system online side of flexible conduit to the system.
   3. The Equipment Grounding Conductors shall be a separate, insulated green conductor. Isolated Equipment Grounding Conductors used in this facility shall be designated by any code approved color and this color shall be consistent throughout.
   4. All circuits serving isolated ground receptacles shall be served from a dedicated isolated ground conductor. This conductor is in addition to the green Equipment Grounding Conductor indicated above.
   5. Providing grounding in patient care areas to meet requirements of NFPA 99 and ANSI/NFPA 70.

E. GROUNDING BUS BARS

1. General
    a. Coordinate exact location of bus bar with all contractors.
    b. Install in an accessible location and to maintain clearance as required by applicable codes. Install between 24” and 72” above finished floor.
    c. Securely mount bus bar to wall. In metal stud wall construction, provide fire treated wood backing as required.
    d. Maintain a 2” minimum clearance from wall.
2. Telecommunication Rooms
    a. Install bus bar near equipment to be grounded to minimize grounding conductor length.
    b. Mount bus bar 36” from any active electronics, system panels or electrical panelboards.

F. NEUTRAL GROUNDING
1. Ground neutral at service or at separately derived sources only. This ground conductor shall be bonded to the Grounding Electrode Conductor.

G. INTERFACE WITH OTHER PRODUCTS
1. Interface with site grounding system installed under Section 33 79 00.
2. Interface with lightning protection system installed under section 26 41 13.

## 3.4 FIELD QUALITY CONTROL

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer’s recommendations using the fall-of potential method.

## 3.5 ADJUSTMENT AND CLEANING

A. Verify all connections are tightened to the proper torque as recommended by the manufacturer.

## 3.6 START UP/MANUFACTURERS FIELD SERVICES

A. None required.

## 3.7 DEMONSTRATION AND TRAINING

A. None required.

END OF SECTION

# SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Conduit and equipment supports.
B. Anchors and fasteners.

### 1.2 SYSTEM DESCRIPTION

A. Provide hangers and support systems for the electrical system.
B. Design of support systems shall be adequate for weight of equipment, conduit and wiring which they carry.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For approval
   1. None required.
B. For record purposes.
   1. As-built/Record Drawings shall accurately indicate the structural components utilized for mounting equipment.
C. Operations and Maintenance Manuals.
   1. Manufacturer's Installation Instructions: None required.
   2. Maintenance Data: None required.

### 1.5 EQUIPMENT DIMENSIONS

A. Refer to floor plan drawings for approximate overall dimensions for the equipment of this section. Minor dimensional increases of 6 inches or less are acceptable unless specific dimensions are indicated for the equipment. Notify the engineer in writing 5 days prior to submitting bid if the dimensional increases will be greater than 6 inches in any dimension.

### 1.6 EXTRA MANUALS

A. Spare Materials
   1. None Required.
B. Maintenance Materials
   1. None required.

### 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2 PRODUCTS

### 2.1 METAL SUPPORTING CHANNEL

A. Manufacturers:

1. ABB Kindorf/Superstrut/Steel City.
2. Elgen Co.
3. ERICO International Corporation.
4. Unistrut
5. Cooper B-Line
6. Ideal Triddon Group Wesanco

B. Channel Types
1. Galvanized steel:
a. Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 and shall be hot-dip galvanized after fabrication in accordance with ASTM A123.
b. Fittings shall be manufactured from steel meeting the minimum requirements of ASTM A907 SS, Grade 33, and hot-dip galvanized after fabrication in accordance with ASTM A123.
c. All hardware shall be stainless steel Type 304 or chromium zinc ASTM F1136 Gr. 3.
d. All hot-dip galvanized after fabrication products must be returned to point of manufacture after coating for inspection and removal of all sharp burrs.
2. Epoxy painted steel:
a. Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS Grade 33, then painted with water born epoxy applied by a cathodic electro-deposition process.
b. All fittings and hardware shall be zinc plated in accordance with ASTM B633 (SC3 for fittings, SC1 for threaded hardware).
3. Stainless steel:
a. All strut, fittings and hardware shall be made of AISI Type 304 or Type 316 stainless steel as indicated.
4. Accessories as required for supporting attached conduit and equipment.

## 2.2 LIGHTING FIXTURE SUPPORT

A. Items such as stems, hickeys, bar hangers and clips as required to securely attach fixtures to ceilings or walls.
B. Studs and Unistrut support for fixture outlet and ceiling support.
C. Fixture grid hangers for mounting surface units to exposed grid ceiling.
D. Provide auxiliary support so that the fixtures can be drawn up tightly, cannot be tilted or rotated, and will not be affected by vibrations.

## 2.3 MOUNTING PANELS

A. Size mounting panels to mount necessary equipment, of ¾ inch fire retardant plywood as indicated on drawings.
B. Provide uniform mounting panels as far as practical.

## 2.4 CONDUIT SUPPORTS

A. Conduit clamps, straps, supports and similar items shall be steel or malleable iron.
B. One hole straps for conduits 1" and smaller. Two hole straps for conduits larger than 1". Galvanized steel straps for metal conduits and plastic straps for nonmetallic conduits.
C. Where penetrating conduit weight is supported by floor, provide manufactured product or structural bearing collar designed to carry load.
D. Continuous bracket to support the size transformer as indicated on drawings.
E. Spring steel clips with snap-close clamps:
1. Spring Steel Clip products shall be provided with corrosion resistance and be warranted against failure from corrosion for a period of ten (10) years from date of manufacture.

2. Conduit clamp shall pivot a full 360 degrees and snap close around the conduit. Push-in type conduit clamps are not acceptable.
3. Bar joist installtion shall require a hammer to install onto the supporting surface.
4. Wall stud installation shall require a fastener to mount clip to the stud.
5. Box/conduit combination hanger shall be supported via a wire or rod.

## 2.5 ANCHORS

A. General
   1. Shall be rated for the building material it is installed and for the load supported.
B. Metal: Zinc-coated or stainless steel insert wedge style for use in concrete or masonry.
C. Nylon: shall be 2 way expansion type with rapid fixing and high pull-out values. Anchor shall have be manufactured to restrict rotation after inserted into hole and not faull out of overhead holes.
D. Powder-Actuated: Provide with threaded steel stud, for use in concrete and masonry construction.

## 2.6 HARDWARE

A. Corrosion resistant or as noted for each product above.
B. Toggle bolts shall be all steel with springhead.
C. Threaded Rod shall be minimum of 3/8".

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Inspect and report concealed damage to carrier.
B. Handle carefully to avoid damage to material and finish.
C. Store in a clean, dry location. Maintain factory packaging and, as required, provide additional heavy canvas or heavy plastic cover to protect materials from dirt, water, construction debris and traffic.

## 3.2 EXAMINATION AND PREPARATION

A. Verify area is ready to receive electrical equipment or materials.
B. Install hangers, supports, and anchors only after structural work, where work is to be installed, has been completed. Correct inadequacies such as proper placement of inserts, anchors, and other building structural attachments.
C. Examine areas and conditions under which equipment and associated components are to be installed and notify Architect, in writing, of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.
D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

## 3.3 INSTALLATION

A. General
   1. Install products in accordance with manufacturers' instructions.
   2. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
   3. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
   4. Do not drill or cut structural members without approval from the Architect/Engineer.
B. Mounting Panels
   1. Install plywood mounting panels parallel and perpendicular to the structure.

2. Paint plywood with 2 coats of paint without covering the fire retardant label on the plywood.

C. Lighting Fixtures
1. Install channel supports across main grid runners or grid supports, securely tied down or anchored for fixtures and devices mounted in suspended ceiling systems so as not to cause tile to sag and so that fixture or device cannot be lifted, rotated, or displaced. Provide additional support of ceiling grid or tees at those locations where tiles and ceiling grid sags.
2. Install grid troffer support clips I accordance with NEC 410.

D. Building Attachments
1. Install building attachments at required locations within concrete or on to structural steel or raceway and equipment support.
2. Install additional building attachments where support is required for additional concentrated loads.
3. Install concrete inserts before concrete is placed.

E. Anchors
1. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31 and to prevent the transfer of loading and stresses to connected equipment.
2. Installation methods shall be in conformity with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of hole be less than four bolt diameters. Minimum distance between the center of any expansion anchor and an edge of exterior corner of concrete shall be not less than 42 times the diameter of the hole in which it is installed.

F. Support of Conduit
1. Fasten conduit to structural parts of building in a manner acceptable to Engineer.
2. Do not use perforated hanger iron.
3. Install concrete insert channel as required, with spacings as recommended by manufacturer. Install with anchor and caps, insert joiner clips and closer seals as required.
4. Support conduit as follows:
   a. Single conduit runs:
      1). Vertical Surfaces: Galvanized, heavy duty, sheet steel straps; back straps to be provided for all exposed conduit and conduit on exterior walls.
      2). Horizontal Surfaces: Galvanized, heavy duty, 2-hole steel pipe straps.
   b. Multiple conduit runs:
      1). Vertical surfaces: Horizontal or vertical rack channel with conduit straps as required.
      2). Horizontal Surfaces: Single or double rack channel trapeze, complete with conduit straps as required; all supported with thread hanger rods.
5. Roof penetrations:
   a. 13 in. and larger conduit runs passing through floors shall be supported at each floor with riser pipe clamps.
   b. Conduit extending through roof shall not pass through a ceiling box at roof lines.
   c. Provide 14 ga. minimum copper box complete with watertight soldered seams and flanged to serve as pitch pocket for each conduit.
   d. Conduit and pitch pocket shall be installed in advance of roofing work.

G. Vertical Cable Support
1. Conductors in vertical raceways shall be supported using suitable cable supports. Locate supports every 40 ft 0 in. length of conductor in a vertical raceway or as required by Code.

H. Equipment Closures
1. Install surface-mounted cabinets and panelboards with minimum of four anchors.

2. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch (25 mm) off wall.
3. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

## 3.4 SUPPORT PROTECTION

A. In occupied areas, mechanical and electrical rooms and areas requiring normal maintenance access, guard certain equipment to protect personnel from injury.
B. Provide minimum ½" thick Armstrong Armaflex insulation or similar product applied with Armstrong 520 adhesive on lower edges of equipment, including busway, cable tray, pull boxes and electrical supporting devices suspended less than 7 feet above floors, platforms or catwalks in these areas.
C. Protect threaded rods or bolts at supporting elements as described above. Trim threaded rods or bolts such that they do not extend beyond supporting element.

## 3.5 FIELD QUALITY CONTROL

A. Verify all connections are tightened to the proper torque as recommended by the manufacturer.

## 3.6 ADJUSTMENT AND CLEANING

A. Verify all connections are tightened to the proper torque as recommended by the manufacturer.

## 3.7 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.8 DEMONSTRATION AND TRAINING

A. None required.

END OF SECTION

# SECTION 26 05 31 - CONDUIT FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Metal conduit.
B. PVC coated metal conduit.
C. Flexible metal conduit.
D. Liquid tight flexible metal conduit.
E. Electrical metallic tubing.
F. Non-metallic conduit.
G. Specialty fittings
H. Roof Pipe Curbs.

### 1.2 SYSTEM DESCRIPTION

A. Provide the conduit for the various electrical systems as specified herein.
B. Any conduit routings shown on Drawings are approximate locations unless dimensioned. Route as required to complete wiring system.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For Approval
   1. None required
B. For Record Purposes
   1. Accurately record actual routing of all feeder conduits on record or as-built drawings
   2. Record drawings shall show locations of feeder, branch circuit conduits, junction boxes and other significant items indicating conduit routing.
C. Operations and Maintenance Manuals
   1. Manufacturer's Installation Instructions: None required.
   2. Maintenance Data: None required.

### 1.5 EQUIPMENT DIMENSIONS

A. Not applicable.

### 1.6 EXTRA MATERIALS

A. Spare Materials
   1. None required.
B. Maintenance Materials
   1. None required.

### 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2 PRODUCTS

### 2.1 GENERAL

A. The products listed under Part 2 - Products are intended as conduit type definitions only. All allowable installation methods and required conduit types for those installations are defined under Part 3 - Execution. All conduit types listed under this section may not be approved for use on this project.

### 2.2 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.
B. Intermediate Metal Conduit (IMC): Rigid steel ANSI C80.6.
C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit. Fittings shall be liquidtight, threaded with insulated throat and plastic bushing.

### 2.3 PVC COATED METAL CONDUIT

A. Description: NEMA RN 1: Rigid steel conduit with external PVC coating, 40 mil thick.
B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel fittings with external PVC coating to match conduit. Fittings shall be the same as metal conduit. PVC gasketing for mating surfaces.

### 2.4 FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction.
B. Fittings: ANSI/NEMA FB 1. Fittings shall be malleable steel construction, grounding type, two screw clamp type with locknuts and plastic bushing.

### 2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Description: Interlocked steel construction with PVC jacket.
B. Fittings: ANSI/NEMA FB 1. Fittings shall be malleable steel construction with non-metallic covering, tapered threaded hub, grounding type, liquid tight with plastic bushing.

### 2.6 ELECTRICAL METALLIC TUBING (EMT)

A. Description: ANSI C80.3; galvanized tubing.
B. Fittings and Conduit Bodies: ANSI/NEMA FB1. Fittings shall be steel, glandular compression type, rain and concrete tight with insulated throat or plastic bushing.

### 2.7 NONMETALLIC CONDUIT

A. Description: NEMA TC 2; Schedule 40 PVC.
B. Fittings and Conduit Bodies: NEMA TC 3, material to match conduit.

### 2.8 SPECIALTY FITTINGS

A. Expansion fittings shall be equivalent to Crouse-Hinds type XJG with copper bonding jumper.
B. Expansion/deflection fittings shall be equivalent to Crouse-Hinds type XD with copper bonding jumper.
C. Plastic Bushings:
   1. For conduit terminations, bushings shall be equivalent to Thomas & Betts 200 Series.

2. For conduit stubs, bushings shall be equivalent to Arlington Industries EMT50 or EMT 75.

D. Bonding and Grounding Bushings shall be equivalent to Thomas & Betts, 3000 Series.

E. Riser Fittings: Vertical cable supports shall be equivalent to O.Z. Gedney Type R and/or DR. and shall be located accessible and removable in junction boxes.

F. Wall entrance seals in new construction shall be equivalent to O. Z. Gedney Type FSK or WSK.

G. Wall entrance seals in existing construction, where the wall is core drilled, shall be equivalent to Link-Seal.

H. Conduit seals for the interior of a conduit shall be equivalent to Roxtec HG series or CalAm 7400 series.

## 2.9 ROOF PIPE CURBS

A. Manufacturers:
   1. Custom Curb.
   2. Pate.
   3. Roof Products and Systems.
   4. ThyCurb.
   5. Vent Products.

B. Curb Construction:
   1. Continuously welded, 18 gauge, galvanized steel shell.
   2. Integral base plate.
   3. 3 lb. density, 1-1/2" thick rigid insulation.
   4. 2" x 2" treated wood nailer.
   5. Compensate for roof pitch for level installation.

C. Minimum height above deck, 12".

D. Cover: Acrylic clad thermoplastic cover, galvanized fastening screws, graduated step boots with stainless steel clamps.

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

C. Protect PVC conduit from sunlight.

## 3.2 EXAMINATION AND PREPARATION

A. Verify area is ready to receive electrical equipment or materials.

B. Verify routing and termination locations of conduit prior to rough-in.

## 3.3 INSTALLATION

A. GENERAL
   1. Provide a separate raceway system for each of the following:
      a. Normal power wiring.
      b. Telephone/data system.
      c. Fire alarm system.
      d. Security system.
   2. Minimum size conduit as outlined below:
      a. 1/2 inch, with exceptions as follow:
         1). 3/8" flexible metal conduit and liquidtight flexible metal conduit shall be allowed under the provisions of NEC article 348-20.

b. Minimum conduit size for exterior underground conduits shall be 1" unless noted otherwise.

3. The conduit installation shall be complete prior to installing conductors and cables.
4. Ground and bond conduit under provisions of Section 26 05 26.
5. Identify conduit under provisions of Section 26 05 53.
6. Install conduit in accordance with NECA "Standard of Installation."
7. Cut conduit square using saw or pipecutter; de-burr cut ends.
8. Bring conduit to shoulder of fittings; fasten securely.
9. Install no more than the equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams.
10. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.
11. Provide #12 pull wire in each empty conduit except sleeves and nipples.
12. Use suitable caps to protect installed conduit against entrance of dirt and moisture.

B. INDOOR INSTALLATIONS

1. Conduits shall be electrical metallic tubing.
2. All conduits shall be concealed in finished spaces.
3. Install conduits above suspended ceiling so that they do not interfere with the removal of the ceiling tile.
4. Conduits may be routed exposed in unfinished areas such as mechanical rooms.
5. Conduits shall be installed within the building envelope, in insulated portions of the building and follow the most accessible routes.
6. Conduits shall be concealed in finished areas, and exposed to minimum temperature gradient or fluctuation.
7. Arrange supports to prevent misalignment during wiring installation.
8. Secure conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers, minimum spacing per code.
9. Group related conduits; support using conduit rack. Construct rack using steel channel.
10. Secure conduit supports to building structure and surfaces under provisions of Section 26 05 29.
11. Do not support or fasten 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 conduit parallel and perpendicular to walls.
15. Maintain adequate clearance between conduit and piping. Route conduit above water, fluid or steam piping wherever possible.
16. Maintain 12 inches (300 mm) of clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C). Do not route conduit over boiler, incinerator, or other high temperature equipment.
17. Final connections to transformers, motors, generators, and other vibration producing equipment shall be made with appropriately sized flexible conduit. Length of flexible conduit connection shall be kept to a minimum.

C. OUTDOOR INSTALLATIONS

1. General
   a. Trapped conduit runs without facilities for continuous drainage are not acceptable. Provide junction box with drain fitting at low points in conduit system.
   b. No conduits shall be visible from the exterior of the building except as noted on the drawings.
2. Above Grade
   a. Use rigid metal conduit.
3. Below Grade
   a. From a minimum of 1 foot inside the building to a minimum of five feet outside the building, where conduit penetrates the foundation wall: Use PVC coated metal conduit.

b. More than Five Feet from Foundation Wall: Use non-metallic conduit.

D. ADDITIONAL REQUIREMENTS FOR SPECIFIC INSTALLATIONS

1. Damp and wet locations.
   a. Use nonmetallic conduit.
   b. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
2. Nonmetallic conduit installations.
   a. Install nonmetallic conduit in accordance with manufacturer's instructions.
   b. Join conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.

E. INTERFACE WITH OTHER PRODUCTS

1. Refer to section 26 05 00 for fire stopping requirements.
2. Route conduits through roof openings for piping and ductwork or through an independent roof pipe curb. The roof pipe curb shall be turned over to the roofing contractor for installation. If there is not a roofing contractor for the project, install the roof pipe curb per manufacturers' written instructions.

## 3.4 FIELD QUALITY CONTROL

A. Verify all conduit is installed properly and securely mounted.

## 3.5 ADJUSTMENT AND CLEANING

A. All conduit to be painted shall be cleaned per the conduit manufacturer and paint manufacturer requirements.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.7 DEMONSTRATION AND TRAINING

A. None required.

END OF SECTION

# SECTION 26 05 34 - BOXES FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Wall and ceiling outlet boxes.
B. Pull and junction boxes.

### 1.2 SYSTEM DESCRIPTION

A. Provide the electrical boxes as required for the electrical system and as specified herein.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For Approval
   1. None required.
B. For Record Purposes
   1. As-built/Record Drawings shall accurately indicate the structural components utilized for mounting equipment.
C. Operations and Maintenance Manuals
   1. Manufacturer's Installation Instructions: None required.
   2. Maintenance Data: None required.

### 1.5 EQUIPMENT DIMENSIONS

A. Refer to floor plan drawings for approximate overall dimensions for the equipment of this section. Minor dimensional increases of 6 inches or less are acceptable, unless specific dimensions are indicated for the equipment. Notify the engineer in writing 5 days prior to submitting bid if the dimensional increases will be greater than 6 inches in any dimension.

### 1.6 EXTRA MATERIALS

A. Spare Materials
   1. None required.
B. Maintenance Materials
   1. None required.

### 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2 PRODUCTS

### 2.1 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.

1. Luminaire Boxes: 4 inch octagon box set flush with finished surface, complete with 3/8 inch fixture stud.
2. Concrete Ceiling Boxes: Concrete type, 4 inch octagon box with minimum 2-1/8 inch depth, complete with 3/8 inch fixture stud.
3. Device Boxes: 4 inch square with raised cover having square corners and internally mounted ears, 1-1/2 inch deep minimum or square corner, galvanized masonry type with internally mounted ears, 2 1/2 inch deep minimum.
4. Box Support Bracket: Sheet metal box support bracket for metal stud walls, B-Line BB4 series or equivalent.

B. Cast Boxes: NEMA FB 1, Type FD, aluminum or cast feralloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.

## 2.2 PULL AND JUNCTION BOXES

A. General Purpose Junction and Pull Boxes:
1. NEMA OS 1, fabricated from code gauge galvanized steel, with covers held in place by corrosion resistant machine screws.
2. Size as required by code for number of conduits and conductors entering and leaving box.
3. Provide with welded seams, where applicable, and equip with corrosion-resistant nuts, bolts, screws, and washers.

B. Weatherproof Junction and Pull Boxes:
1. Stainless steel or cadmium plated malleable iron cast type with threaded hubs, cast cover, and neoprene gasket.

C. Nonmetallic Junction and Pull Boxes:
1. NEMA OS 2, PVC or PPO thermoplastic, with covers held in place by corrosion resistant machine screws.
2. Size as required by code for number of conduits and conductors entering and leaving box. Provide neoprene gasket for wet or damp box locations.

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Accept material on site. Inspect for damage.
B. Protect material from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
C. Protect PVC boxes from sunlight.

## 3.2 EXAMINATION AND PREPARATION

A. Verify the area is ready to receive electrical equipment or materials.
B. Verify door swings before installing room light control boxes. Install boxes on latch side of room door unless noted otherwise.
C. Verify locations of all floor boxes with Architect prior to rough-in.

## 3.3 INSTALLATION

A. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. Exact location is to be verified and shall be determined by:
1. Construction or code requirements.
2. Conflict with equipment of other trades.
3. Equipment manufacturer's drawings.

B. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
C. Where receptacles and communications outlets are indicated adjacent to each other

on the drawings, the outlet boxes shall be physically adjacent to each other and not spaced according to stud spacings. The Contractor shall fabricate box supports to allow all outlet boxes to be mounted adjacent to each other within the same stud space.

D. Minor modifications in the location of outlets and equipment is considered incidental up to a distance of 10 feet, provided the change in location is requested prior to rough-in.
E. Install electrical boxes to maintain headroom and to present a neat mechanical appearance. Locate boxes so as to assure accessibility of electrical wiring.
F. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
G. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
H. Install boxes to preserve fire resistance rating of partitions and other elements.
I. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
J. Use flush mounting outlet boxes in finished areas.
K. Do not install flush mounting boxes back-to-back in walls; provide minimum 12-inch separation. Provide minimum 24 inches separation in acoustic rated walls.
L. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
M. Use stamped steel bridges to fasten flush mounting outlet box between studs.
N. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
O. Use adjustable steel channel fasteners for hanging ceiling outlet boxes.
P. Do not fasten boxes to ceiling support wires.
Q. Support boxes independently of conduit.
R. Use gang box where more than two devices is mounted together. Do not use sectional box.
S. Use 4” square box with plaster ring for single and double device outlets.
T. Use cast outlet box in exterior locations and wet locations.
U. Use handy boxes only where specifically detailed on the drawings.
V. Boxes shall be sized per code to accommodate the number and size of conduit entrances to the box and to accommodate the number of conductors, splices, fittings, etc. within the box. Box extensions used solely to create additional box volume to meet N.E.C. box fill requirements shall be prohibited.
W. Provide additional support for all recessed mounted wall boxes in metal stud walls so that the box will be stabilized in the stud space by utilizing a box support bracket. Provide proper box support based on wall stud size.
X. INTERFACE WITH OTHER PRODUCTS
    1. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. 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 luminaries as shown on reflected ceiling plan.

## 3.4 FIELD QUALITY CONTROL

A. Verify all boxes are securely mounted and properly labeled.

## 3.5 ADJUSTMENT AND CLEANING

A. Adjust flush-mounting outlets to make front flush with finished wall material.
B. Install knockout closure in unused box opening.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.7 DEMONSTRATION AND TRAINING

A. None required.

END OF SECTION

# SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Nameplates and labels.
B. Wire and cable markers.
C. Conduit markers.

### 1.2 SYSTEM DESCRIPTION

A. Provide the identification for electrical equipment and devices as specified herein.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For Approval
   1. Submit the method of labeling for the wiring device labeling method. Also, submit the method of nameplate labeling for electrical distribution equipment as herein indicated.
B. For Record Purposes
   1. None required.
C. Operations and Maintenance Manuals
   1. None required.

### 1.5 EQUIPMENT DIMENSIONS

A. None required.

### 1.6 EXTRA MATERIALS

A. Spare Materials
   1. None required.
B. Maintenance Materials
   1. None required.

### 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2 PRODUCTS

### 2.1 NAMEPLATES

A. Nameplates: Engraved three-layer laminated plastic. Nameplates for equipment which are served from the normal distribution system shall have black letters on white background. Nameplates for equipment which are served from the emergency distribution system shall have white letters on a red background.
B. Locations:

1. Each electrical distribution and control equipment enclosure.

C. Letter Size:
   1. Use 3/16 inch letters for identifying individual equipment and loads.
   2. Use 1/4 inch letters for identifying grouped equipment and loads.

## 2.2 DEVICE LABELS

A. Labels: Embossed adhesive tape, with 3/16 inch black letters on white background. Use for identification of individual wall switches and receptacles, and control device stations.

## 2.3 WIRE MARKERS

A. Description: Split sleeve type adhesive markers.
B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
C. Legend:
   1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
   2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.
   3. System Circuits: All wiring associated with the various systems shall be identified with the circuit number and type. For example, fire alarm wiring shall be identified as notification circuit (audio and/or visual) and initiation circuits (signaling line or zoned).

## 2.4 CONDUIT LABELS

A. Manufacturers:
   1. W.H. Brady.
   2. Seton Nameplate Company.
B. Tape Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings; secure with 2" wide tape with arrows indicating flow.
C. Lettering Size: Minimum 1-1/2” high.

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Inspect and report concealed damage to carrier.
B. Handle carefully to avoid damage to material and finish. Damaged products will not be installed.
C. Store in a clean, dry location. Maintain factory packaging and, as required, provide additional heavy canvas or heavy plastic cover to protect material from dirt, water construction debris and traffic. Wet materials will be unpacked and dried before storage.

## 3.2 EXAMINATION AND PREPARATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of cable trays. Do not proceed with installation until unsatisfactory conditions have been corrected.
B. Degrease and clean surfaces to receive nameplates and labels.
C. The verbiage utilized for identification purposes shall be the actual names or room numbers as designated by the Owner.

## 3.3 INSTALLATION

A. Perform Work in accordance with NECA Standard of Installation.
B. Trays: Capable of supporting a concentrated load of 200 lb at any point, over and above full cable load.
C. Install nameplates and labels parallel to equipment lines.
D. Secure nameplate to equipment front using adhesive.
E. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
F. Conduit Labels:
    1. Install in accordance with manufacturer's instructions.
    2. Locations:
        a. Concealed and exposed conduit.
    3. Pipe Identification:
        a. Identify the following:
            1). System wiring as described in this specification section.
        b. Install label in clear view and align with axis of piping.
    4. Locate identification as follows:
        a. A maximum of 20 feet apart on straight runs including risers and drops.
        b. Adjacent to each junction box and condulet body.
        c. At each side of penetration of structure or enclosure.
        d. At each obstruction, where the conduit is not visible for more that 20 feet.
F. Color Coding for Wiring:
    1. 480 Volt System: Conductors shall be identified brown, orange, and yellow with a gray neutral. (A Phase - Brown, B Phase - Orange, C Phase - Yellow.)
    2. 208 Volt System: Conductors shall be identified black, red and blue with a white neutral. (A Phase - Black, B Phase - Red, C Phase - Blue.)
    3. 240 Volt System: Conductors shall be identified pink, purple and white with red stripe. (A Phase - Pink, Grounded B Phase or neutral - White with Red Stripe, C Phase - Purple.)
G. Junction boxes, pull boxes and equipment shall be stenciled or labeled as follows:
    1. Normal power Light and Power box covers shall be painted white. Indicate the panel and circuit number housed within the junction and pull box cover. If box is mounted with cover facing up, indicate panel and circuit number on the side of the box.
    2. Fire Alarm box covers shall be painted red. Indicate the circuits housed within the box and indicate where the circuits originate from; panel or transponder.

H. Exit Lights:
    1. Exit light canopies shall be labeled with the panelboard designation and the circuit number.
I. Receptacle covers shall be labeled with the panelboard designation and the circuit number. Install labels in a neat and concise manner. Handwritten identification is not acceptable.
J. Switches
    1. Switch covers shall be labeled with the panelboard designation and the circuit number.
    2. Install labels in a neat and concise manner. Handwritten identification is not acceptable.
K. Control panels with dedicated line voltage power source shall have a label indicating the panel and circuit number.
L. Fire alarm system devices shall be label with the device number/address. This label shall be affixed to the base of the device, and not the removable head.
M. All conduits associated with the fire alarm systems shall be labeled at each junction box and initiating device location, indicating if the loop conductors housed in this conduit are

incoming or exiting loop conductors. The labeling system shall be approved by the owner.

N. Existing Panelboards:
   1. Provide typed circuit directory for each panelboard. The use of adhesive applied directories is not acceptable. The directory shall accurately indicate the types of devices served and the rooms in which the devices are located. The rooms and panelboards shall be designated by the actual name or number designated by the Owner. Revise directory to reflect circuiting changes required to balance phase loads.

O. Panelboard/Load Center nameplates shall be engraved as follows:
   1. Panelboard Designation: Per the drawings.
   2. The Utilization Voltage: For example, "208/120V 3 PHASE 4 WIRE".
   3. The designation of the panelboard, switchboard, motor control center, etc., from which this panelboard is served.
   4. The room where the source panelboard, switchboard, motor control center, etc., is located. If the source panelboard, switchboard, motor control center, etc. is in the same room, then indicate "THIS ROOM" on the nameplate.
   5. When a panelboard or load center is installed in a public space, confirm with the owner if the nameplate should be installed on the inside of the door for accessing the circuit breaker handles.

P. Motor starter and VFD nameplates, when furnished by the Electrical Contractor, shall be engraved with the following:
   1. Motor starters and VFDs shall be identified as to the load served. Where the load served is a motor, the HVAC motor designation or other description (ex. Elevator #1) shall be used in lieu of the motor number on the electrical drawings.
   2. The designation of the panelboard, switchboard, motor control center, etc., which this motor starter is served from. Utilize the designation as per the drawings.

Q. Disconnect switch and enclosed circuit breaker nameplates shall be installed as follows:
   1. For enclosed circuit breakers in public areas, the nameplates shall be attached to the inside face of the cover. Nameplates for enclosed circuit breakers and disconnect switches in equipment rooms and other non-public areas shall be attached to the outside face of the cover. The lettering on the nameplates shall be engraved with the following information:
      a. The designation of the panelboard, switchboard, motor control center, etc., which this equipment is served from. Utilize the designation per the drawings.
      b. Load served which shall be the next downstream device (panelboard, transformer, transfer switch, motor, etc.). Where the load served is a motor, the HVAC motor designation or other description (i.e. elevator #1) shall be used in lieu of the motor number on the electrical plans.

R. Individually mounted transformers, such as indoor dry type or outdoor pad mounted unit nameplates shall be engraved as follows:
   1. Transformer Designation: Per the drawings.
   2. The designation of the panelboard, switchboard, motor control center, etc., which this transformer is served from.
   3. The room where the source panelboard, switchboard, motor control center, etc., is located if remote from the transformer.
   4. The designation of the panelboard switchboard, motor control center, etc., served by this transformer. Utilize the designation indicated on the drawings.

## 3.5 FIELD QUALITY CONTROL

A. Verify all nameplates have the correct equipment designations and room information.
B. Verify all nameplates are securely fastened to the equipment.

## 3.6 ADJUSTMENT AND CLEANING

A. Clean all nameplates when cleaning equipment. Remove dirt from lettering.

## 3.7 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.8 DEMONSTRATION AND TRAINING

A. None required.

END OF SECTION

# SECTION 26 05 71 - ELECTRICAL DISTRIBUTION SYSTEM STUDIES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Short Circuit Study
B. Arc-Flash Hazard Analysis

### 1.2 SYSTEM DESCRIPTION

A. The electrical system short-circuit and protective device coordination studies shall include the following portions of the distribution system associated with this project.
   1. All new distribution system associated with this project.
   2. All equipment control panels where both line voltage and controls are present and as specified herein.
B. The electrical system short-circuit and protective device coordination study shall be performed in two phases, a preliminary and a final phase.
   1. Preliminary Report: This is a partial report, and is required to be submitted prior to, or at the same time as, the distribution equipment and overcurrent protective device shop drawings. It is understood that at the time of shop drawings that exact feeder routing and lengths are unknown. The intent of the preliminary submittal is to avoid equipment field changes resulting from interrupting ratings being too low and/or NEC article 700 and 701 selective coordination requirements not being achieved.
      a. Short Circuit Study. Provide a tabular summary of all calculated short circuit ratings based on utility information and estimated feeder lengths. For this report, estimated feeder lengths should be conservative (shorter) than what may be installed in the field. As a minimum, use “point-to-point” dimensions between equipment as located on the drawings, and 10’ floor-to-floor dimensions for vertical runs.
      b. Arc Flash Study. Provide a tabular summary of the arc flash calculations at each distribution point, along with the required PPE level.
      c. Comments. Provide an executive summary including any recommended equipment changes necessary to meet all code requirements.
   2. Final Phase: Provide a complete final report as detailed in this specification, based on updated feeder dimensions and approved distribution and overcurrent device shop drawings.
C. Collect field data as required. This shall include gathering information on new and existing motors, length and clarification of new feeders and new device characteristics.
D. The studies shall be accomplished so that circuit breaker and/or relay specification recommendations, this would include all protective relay settings for the medium votlage generators and distribution, are submitted prior to or at the same time as the distribution equipment shop drawings so that the correct relays or circuit breaker options are ordered in a timely manner at no added cost to the Owner.
E. Perform a short-circuit study using the latest ANSI/IEEE Standards calculation methods and EasyPower or SKM PowerTools software. Provide an electronic copy of all EasyPower or SKM files for the project on a CD.
   1. System connections which result in maximum fault conditions shall be adequately covered in the study.
   2. Short-circuit momentary duty values and interrupting duty values shall be calculated on the basis of assumed three-phase bolted faults, line-to-line faults, line-to-line-to-ground faults, line-to-ground faults, and three-phase-to-ground faults at each switchboard and switchgear bus, transformer, panel boards and significant location in the system. Short circuit study shall also include calculations based

upon multiple sources, such as alternate utility sources, system bus ties (in optional system configurations), standby emergency systems, etc.

3. The short-circuit tabulations shall include symmetrical fault currents and X/R ratios. For each fault location, the total duty on the bus as well as the individual contribution from each connected branch shall be listed with its respective X/R ratio.
4. Compare the results of the short circuit study with the short circuit ratings of the new and existing equipment (if applicable) to evaluate their capability to withstand and clear a fault condition and provide personnel protection, without heavy damage to the equipment or surroundings. Verify that all equipment is applied within its rating. Provide a report to summarize the data and the results of the short-circuit study. Provide recommendations to adjust or replace equipment that is not properly rated for the available short-circuit current.
5. Conductor for data table including all feeder characteristics and overcurrent protection.

F. Using the results of the short-circuit study; perform a protective device coordination study for the system described in Section 1.2.A above.
   1. The coordination study shall include computer-drawn coordination curves which illustrate proper relay/breaker settings and fuse size selection to obtain proper coordination and protection of the equipment. The coordination curves shall be drawn on Keuffel and Esser log-log paper #48-5258 or approved computer equivalent.
   2. The plots (no longer than 11" x 17") shall include complete titles, a simplified single-line diagram for the portion of the system being coordinated, significant motor starting characteristics, complete parameters of transformers, minimum melt and total clearing characteristics of fuses, and complete operating bands of low voltage circuit breaker trip curves. The coordination plots shall indicate the type of protective devices selected, proposed relay taps, time dial and instantaneous settings, transformer magnetizing inrush and ANSI withstand curves, cable thermal overcurrent withstand limits, and significant symmetrical and asymmetrical fault currents. A maximum of eight (8) devices shall be shown on any sheet.
   3. All restrictions of the NEC shall be adhered to and proper coordination intervals and separation of characteristic curves shall be maintained.
      a. Normal branches shall be coordinated.
      b. Life Safety, Critical, Equipment, Elevator, and Fire Pump branches shall be selectively coordinated including the following:
         1). Over current protective devices between the utility services and the smallest branch circuit over current protective devices,
         2). Over current protective devices between the generators and the smallest branch circuit overcurrent protective devices.
   4. Separate coordination plots shall be provided for phase devices and ground-fault devices.

G. As part of the studies, a listing of recommended relays, circuit breakers, fuses, etc., including complete ordering information, shall be provided in a timely fashion.

H. The Arc-Flash Hazard Analysis
   1. The analysis shall be performed with the aid of computer software intended for this purpose in order to calculate Arc-Fault Incident Energy (AFIE) levels and flash protection boundary distances.
   2. The analysis shall be performed on conjunction with a short-circuit analysis and a time-current coordination analysis.
   3. Results of the analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arching fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.
   4. The analysis shall be performed under worst-case arch-flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

5. The analysis shall be performed by a registered professional engineer.
6. The analysis shall be performed in compliance with IEEE Standard 1584-2002, the IEEE Guide for Performing Arc-Flash Calculations.
7. The analysis shall include recommendations for reducing AFIE levels and enhancing worker safety.
8. The proposed vendor shall demonstrate experience with Arc-Flash Hazard Analysis by submitting names of at least ten actual arc-flash hazard analyses is has performed in the past year.
9. The proposed vendor shall demonstrate capabilities in providing equipment, services and training to reduce arc-flash exposure and train workers in accordance with NFPA 70E and other applicable standards.
10. The proposed vendor shall provide equipment labels in compliance with NEC-2002 Section 110 and ANSI Z535.4 to identify AFIE and appropriate Personal Protective Equipment classes.

## 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

## 1.4 SUBMITTALS

A. For Approval
   1. Within two (2) weeks of award of the Contract, submit resume of the Study Engineer's qualifications.
   2. Submit the final report in the quantity dictated by the Architect/Engineer. The final report shall include the following:
      a. Description, purpose, basis, and scope of the study and a single-line diagram of that portion of the power system which is included within the scope of the study.
      b. Tabulations of circuit breakers, fuse, and other protective device ratings versus calculated short circuit duties and commentary on same.
      c. Fault current calculations including a definition of terms and guide for interpretation of computer print-out.
      d. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary on same.
B. For Record Purpose
   1. For the Owner
      a. Bound copy of the final approved report. Also provide a pdf copy of the final report as requested by the owner.
   2. For the Engineer
      a. Bound copy of the final approved report. Also provide a pdf copy of the final report as requested by the Engineer.
      b. An electronic copy of all SKM Powertools files used in creating the study.
C. Operations and Maintenance Manuals
   1. None required.

## 1.5 EQUIPMENT DIMENSIONS

A. None required.

## 1.6 EXTRA MATERIALS

A. Spare Materials
   1. None required.

B. Maintenance Materials
   1. None required.

## 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## 1.8 QUALIFICATIONS

A. The Contractor shall have the studies performed by qualified Engineers of the switchgear manufacturer or by an Owner-approved consultant. The Contractor is responsible for providing all pertinent information required by the preparers of the studies.
B. The study shall be performed by an engineer registered in the state where the project is located.
C. The final study shall be sealed and signed by the study engineer.
D. The equipment manufacturer or consulting engineer shall specialize in perform short circuit and protection devices studies and shall have a minimum of five years experience.

# PART 2 PRODUCTS

Not used.

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. None required.

## 3.2 EXAMINATION AND PREPARATION

A. Examine project overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Refer to drawings and the NEC for devices requiring coordination.
B. Proceed with preliminary coordination study only after relevant equipment submittals have been assembled.
C. Final coordination study shall be based on the final approved submittals and the actual equipment supplied for the project.

## 3.3 INSTALLATION

A. Implementation of the study recommendations shall take place only after the Engineer and Owner's approval.
B. The Contractor shall hire an independent testing contractor to perform protective device calibration and apply prescribed settings. This Contractor shall assist testing contractor by providing work force and materials as required.
C. The Contractor shall install and mark the arc flash equipment labels after the short circuit and protective device coordination studies have been completed and implemented. Clean areas of equipment to receive arc flash stickers for proper adhesion of sticker.

## 3.4 FIELD QUALITY CONTROL

A. Verify all overcurrent protective devices in the study match the devices installed
B. Verify all circuit breaker settings and fuse ratings match the study requirements.

## 3.5 ADJUSTMENT AND CLEANING

A. Adjust any circuit breaker settings not in compliance with study.
B. Replace any fuses not in compliance with the study.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.7 DEMONSTRATION AND TRAINING

A. None required.

END OF SECTION

# SECTION 26 08 11 - TESTING ELECTRICAL SYSTEM

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Field testing of electrical distribution equipment.

### 1.2 SYSTEM DESCRIPTION

A. This section specifies the acceptance electrical testing required for the various components of the electrical power system.
B. Refer to the various system specifications for testing requirements of those systems.
C. Prior to energizing equipment, the Electrical Contractor shall perform the tests as specified herein.
D. All new electrical equipment installed as part of this project shall be tested, where a test is specified herein. Test values shall conform to the equipment manufacturer's recommendations and the latest edition of the NETA Acceptance Testing Specifications.
E. Assure that electrical equipment is operational within industry and manufacturer's tolerances and is installed in accordance with design specifications.
F. Inspections and tests shall utilize the following references:
   1. Project design specifications.
   2. Project design drawings.
   3. Manufacturer's instruction manuals applicable to each particular apparatus.
   4. Referenced standards.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For Approval
   1. Submit proof of independent testing contractor qualifications.
   2. Submit preliminary report no later than 10 calendar days after completion of testing.
B. For Record Purpose
   1. Record actual equipment nameplate information.
   2. Permanently record checks and tests and make available to Engineer and Owner.
   3. For the Owner
      a. Three bound copies of the final approved report. Also provide a pdf copy of the final report as requested by the owner.
   4. For the Engineer
      a. One bound copy of the final approved report. Also provide a pdf copy of the final report as requested by the Engineer.
C. Operations and Maintenance Manuals
   1. None Required.

### 1.5 EQUIPMENT DIMENSIONS

A. None required.

### 1.6 EXTRA MATERIALS

A. Spare Materials
   1. None required.
B. Maintenance Materials
   1. None required.

## 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## 1.8 QUALIFICATIONS

A. Meet federal, state, and local safety requirements for accreditation of testing laboratories, Title 29, Part 1907. Membership in National Electrical Testing Association constitutes proof of meeting such criteria.
B. Meet Federal Department of Commerce requirements for nationally independent testing laboratory certification.

# PART 2 PRODUCTS

Not used.

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. None required.

## 3.2 EXAMINATION AND PREPARATION

A. GENERAL FIELD TESTING REQUIREMENTS
   1. Test work and equipment installed to ensure its proper and safe operation in accordance with intent of drawings and specifications.
   2. Check interlocking and automatic control sequences and test operation of safety and protective devices.
   3. Correct defects.
   4. Cooperate with electrical utility, suppliers, and manufacturer's representatives in order to achieve proper and intended operation of equipment.
   5. Test, adjust and record operating voltages at each system level before energizing branch circuits.
   6. Transformer taps must be adjusted to obtain as near as possible nominal system voltage.
   7. Where transformer is under utility jurisdiction, obtain services of utility to correct voltage.
   8. Replace devices and equipment damaged due to failure to comply with this requirement.
   9. Balance load among feeder’s conductors at each panelboard, switchboard, or substation, and reconnect loads as may be necessary to obtain a reasonable balance of load on each phase. Electrical unbalance shall not exceed 7-1/2% between phases. If the Electrical Contractor feels that because of the nature of the load, a 7 1/2% or less unbalance cannot be achieved, the Electrical Contractor shall submit written request to the Engineer for approval.
B. RECEPTACLES
   1. Verify that each receptacle device is energized.

2. Test each receptacle device for proper polarity.
3. Test each GFCI receptacle device for proper operation.

C. BRANCH CIRCUIT WIRING
1. See Section 26 05 21 for additional information.

D. FEEDERS
1. Verify cable color coding with applicable specifications and the National Electrical Code.
2. Each feeder shall be megger tested for insulation resistance.

E. GROUNDING
1. VISUAL AND MECHANICAL INSPECTION
   a. Inspect ground system for compliance with drawings and specifications.
   b. Verify that all electrical distribution equipment is properly grounded.
2. ELECTRICAL TESTS
   a. Fall of Potential test per IEEE Standard No. 81 on main grounding electrode or system.
   b. Two Point Method test per IEEE Standard No. 81 to determine ground resistance between main grounding system, and major electrical equipment frame, system neutral and/or derived neutral points.

F. DRY TYPE TRANSFORMERS (600 VOLTS AND LESS PRIMARY)
1. VISUAL AND MECHANICAL INSPECTION
   a. Inspect for physical damage.
   b. Verify equipment is supplied and connected in accordance with design specifications.
   c. Check tightness of external bolted electrical joints in accordance with manufacturer's instructions.
   d. Verify resilient mounts are released.
   e. Perform specific inspection and mechanical tests as recommended by manufacturer.
2. ELECTRICAL TESTS
   a. Insulation resistance tests shall be performed winding-to-winding and winding-to-ground. Appropriate guard circuit shall be utilized over all bushings. Test voltage and minimum acceptable values shall be in accordance with manufacturer’s recommendations.
   b. Perform a turns-ratio test on all tap connections. Verify that winding polarities are in accordance with nameplate.
   c. Perform power-factor or dissipation-factor tests in accordance with the test equipment manufacturer’s published data.
   d. Testing shall occur prior to making primary and secondary feeder connections (i.e. prior to placing in service).

G. PANELBOARDS
1. VISUAL AND MECHANICAL INSPECTION
   a. Inspect for physical damage.
   b. Verify equipment is supplied and connected in accordance with design specifications.
   c. Inspect for proper alignment, anchorage, and grounding.
   d. Check tightness of accessible bolted bus joints by calibrated torque wrench method. Refer to manufacturer's instructions for proper foot-pound levels.
   e. Doors, panels and Sections shall be inspected for paint, scratches and fit.
   f. Physically test all key interlocking systems.
   g. Proper mechanical operation of relays, switches, and other devices.
   h. Where applicable, verify fuse size are per coordination study.
2. ELECTRICAL TESTS
   a. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 7 1/2 percent of each other. Maintain proper phasing for multi-wire branch circuits.

b. Megger check of phase-to-phase and phase-to-ground insulation levels prior to connection of any load circuits.

H. CIRCUIT BREAKERS - LOW VOLTAGE

1. All circuit breakers regardless of size shall receive the visual and mechanical inspection as indicated below. All circuit breakers which are either 225 amp frame and larger or with a trip setting of 100 amps and larger shall be tested per this Section.

2. VISUAL AND MECHANICAL INSPECTION

a. All circuit breakers regardless of ampacity shall inspected as indicated below:

1). Circuit breaker shall be checked for proper mounting, conductor size and feeder designation.

2). Operate circuit breaker to ensure smooth operation.

3). Inspect case for cracks or other defects.

4). Check tightness of connection with torque wrench in accordance with manufacturer's recommendations.

3. ELECTRICAL TESTS

a. All circuit breakers which are either 225 amp frame and larger or with a trip setting of 100 amps and larger shall be tested as indicated below:

1). Measure contact resistance.

2). Insulation resistance shall be determined phase to phase and phase to ground. Test voltage shall be 1,000 v dc.

3). Perform long-time delay time-current characteristic tests by passing 300 percent rated primary current through each pole separately unless series testing is required to defeat ground fault functions.

4). Determine short-time pickup and delay by primary current injection.

5). Determine ground-fault pickup and time delay by primary current injection.

6). Determine instantaneous pickup current by primary injection using run-up or pulse method.

I. MOTORS

1. Test each motor and permanently record the following information:

a. Motor identification as to load served.

b. Nameplate data.

c. Overload relay equipment.

d. Protective relay (if any) setting.

e. Voltage and current phase readings.

f. Verify that the direction of rotation is correct.

## 3.3 INSTALLATION

A. None required.

## 3.4 FIELD QUALITY CONTROL

A. Perform testing in accordance with the equipment manufacturer’s written recommendations and NETA Acceptance Testing Standards.

## 3.5 ADJUSTMENT AND CLEANING

A. Adjust, clean and correct any deficiencies from inspection and testing.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. These services are described above in Examination section for each type of equipment.

## 3.7 DEMONSTRATION AND TRAINING

A. None required.

END OF SECTION

# SECTION 26 09 23 - LIGHTING CONTROL DEVICES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Room Occupancy/Vacancy Sensors
B. Daylight Sensors
C. Emergency Lighting Control Devices
D. Hardware & Wiring

### 1.2 SYSTEM DESCRIPTION

A. The objective of this section is to ensure the proper installation of the occupancy sensor-based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.
B. The occupancy sensor-based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.
C. Contractor shall warrant all equipment furnished in accordance with this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The supplier's obligation shall include repair or replacement, and testing without charge to the owner, all or any parts of equipment which are found to be damaged, defective, or non-conforming and returned to the supplier. The warranty shall commence upon the owner's acceptance of the project. Warranty on labor shall be for a minimum period of one (1) year.
D. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.
E. Occupancy Sensor controlled rooms: Spaces with occupancy sensors shall have a minimum control of Auto On/ Auto Off from motion detection.
F. Vacancy Sensor controlled rooms: Spaces with Vacancy sensors shall have a minimum control of Manual On/ Auto Off from motion detection and low voltage switches.
G. Daylight Sensor control: Spaces with daylight sensor shall initially be turned On/Off by automatic control system in the area, i.e. occupancy sensor. After the lights are On, the daylight sensor shall automatically control the lights according to ambient daylight contribution. The daylight sensor shall not be overridden by local switch.
H. Refer to Sequence of Operations Schedule for controls strategies applied to spaces.

### 1.3 REFERENCES

A. NFPA 70 - National Electrical Code.
B. ASHRAE 90.1 2013 – Energy Standard for Building (except Low Rise Residential Buildings)
C. IECC 2015 – International Energy Conservation Code.
D. Wisconsin Safety and Professional Services Chapter 363.

### 1.4 SUBMITTALS

A. For Approval
   1. Shop Drawings: Indicate electrical characteristics and connection requirements; cable routing; connection diagrams; and equipment arrangement.
   2. Product Data: Provide electrical and operation characteristics and connection requirements.
   3. Any deviations to this specification must be clearly stated by letter and submitted.
B. For Record Purposes

1. Test Reports: Indicate satisfactory completion of required tests and inspections.
2. “As-Built” documents shall include final location and type of each sensor.
3. Provide “As-Built” wiring diagrams showing interconnection of all components and accessories.

C. Operations and Maintenance Manuals
1. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products.

## 1.5 EXTRA MATERIALS

A. Spare Materials
1. Provide one type of each sensor and power pack installed on this project.

B. Maintenance Materials
1. None required.

## 1.6 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

A. The Watt Stopper
B. Greengate
C. Hubbell
D. Leviton
E. Sensor Switch (microphonic technologies acceptable as alternate to ultrasonic).
F. Substitutions: Under provisions of Section 26 05 00.

## 2.2 OCCUPANCY/VACANCY SENSORS

A. All products shall be of the same manufacturer.
B. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time-delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
C. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time-delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
D. The drawings indicate the types of sensors and their relative location. Below is a listing of these type designations, a description of each, and basis of design product information:
1. Type A: 600 sqft 360 degree coverage, ultrasonic, ceiling mounted.
2. Type B: 1000 sqft 360 degree coverage, ultrasonic, ceiling mounted.
3. Type C: 90 lineal feet coverage, ultrasonic, ceiling mounted.
4. Type D: 600 sqft 180 degree coverage, passive infrared , wall switch sensor with 0-10V dimming. Adjust settings for Manual-On, if required for project.
5. Type E: 1500 sqft 120 degree coverage, passive infrared, corner mounted.
6. Type F: Timer switch, adjustable from 10 minutes to 2 hours, wall mounted.
7. Type G: 1000 sqft. 360 degree coverage, Dual Technology, ceiling mounted.
8. Type H: 600 sqft 180 degree coverage, dual technology, wall switch sensor, dual level. Adjust settings for 50% Auto-On, 50% Manual On as need per Code Requirements.
9. Type J: 1500 sqft 120 degree coverage, dual technology, corner mounted.
10. Type K: 600 sqft 180 degree coverage, passive infrared, wall switch sensor, single

level. Adjust settings for Manual-On.

11. Type L: High-bay sensor, passive infrared, luminaire mounted. Operating ambient conditions from 32 to 149 degrees Fahrenheit.
    a. L1: Coverage up to 20ft height; 40ft diameter, 360 degree
    b. L2: Coverage up to 40ft height; 50ft diameter (min), 360 degree
    c. L3: Coverage up to 40ft height; aisle coverage
12. Type M: Extreme-Temperature sensor, passive infrared, ceiling/wall mounted. Operating ambient conditions from -40 to 125 degrees Fahrenheit.
13. "/HV" represents an HVAC interface requirement. When shown on plans, provide auxiliary relay or isolated relay for interface with HVAC. Auxiliary relay may be provided integral to the sensor or as a separate module.
    a. Refer to schedules, specification and sequence of operations in Division 23 for interface requirements.
14. "/D" represents the Digital version of sensor Type to be used on the lighting control system defined in specification 26 09 29.
15. "/WP" represents a sensor requiring a wet listing per space requirement. Provide technology and coverage as identified in Types above.

E. All sensors to be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
F. Power and Auxiliary Packs rated at 20A, 120/277VAC.
G. All powerpacks and auxiliary packs shall be wired ahead or separate of any switching devices to remain active from motion, regardless of switch status. A switch device can include, but is not limited to, line voltage switches, wallbox dimmers, etc.
H. All powerpacks and auxiliary packs shall not be wired in line with a relay-controlled circuit to maintain constant power at all times. Continuous switching of power to the powerpack and auxiliary pack may result in loss of programming or shortened device lifespan. Wall switch sensors shall be capable of detection of motion at desk top level up to 300 square feet and shall have manual on, automatic off.
I. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180 degrees coverage capability.
J. Passive infrared sensors shall have a multiple segmented lens, in a multiple-tier configuration, with grooves-in to eliminate dust and residue built-up.
K. All sensors shall be capable of operating normally with any electronic ballast, PL lamp systems and rated motor loads.
L. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
M. All sensors shall have readily accessible, user adjustable controls for time delay and sensitivity. Controls shall be recessed to limit tampering.
N. All wall mounted sensors shall have selectable Manual-On and Auto-On function.
O. In the event of failure, a bypass manual "override on" shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.
P. Ultrasonic operating frequency, minimum 30kHz, shall be crystal controlled to within plus or minus 0.005% tolerance to assure reliable performance and eliminate sensor crosstalk. Sensors using multiple frequencies are not acceptable.
Q. All sensors shall provide a method of indication to verify that motion is being detected during testing and that the unit is working.
R. All sensors shall have no leakage current to load, in Manual or in Auto/Off mode, for safety purposes and shall have voltage drop protection.
S. All sensors shall have UL rated, 94V-O plastic enclosures.
T. Sensors shall control all lighting within a space, including undercabinet lighting shown on plans, unless noted otherwise. Specific zone control shall be indicated on drawings with switch legs. EC shall provide required powerpacks and auxiliary packs as required to achieve.

## 2.3 DAYLIGHT SENSORS

A. General
   1. Lighting control set points/ranges are based on two lighting conditions:
      a. When no daylight is present.
      b. When significant daylight is present (target level).
      c. System programming is done with a hand-held, remote-control tool.
   2. Definitions:
      a. Closed Loop: Sensor that is positioned in the space/zone it is controlling, measuring both natural and artificial light contribution.
      b. Open Loop: Sensor that is positioned near fenestration, aimed outside, measuring only natural light contributing to the space.
   3. General Sensor Light-Level Monitoring Ranges:
      a. General Space Sensors: 10 to 200 fc with an adjustment for turn-on and turn-off levels within that range.
      b. Atrium Space Sensors: 100 to 1000 fc, with an adjustment for turn-on and turn-off levels within that range.
      c. Skylight Sensors: 1000 to 10,000 fc, with an adjustment for turn-on and turn-off levels within that range.
B. Type A: Dimming (0-10V) Daylight Sensor
   1. Low voltage, ceiling-mounted daylighting control device, powered by 24 VDC supplied by power pack.
   2. Provide dimming over the full range from .2VDC to 10VDC.
   3. Provide a closedoop device.
   4. Single / Multi zone control.
   5. Capable of controlling up to 50 standard 0-10VDC electronic dimming ballasts or drivers.
   6. Refer to Sequence of Operations for target light levels within each space.
   7. "/D" represents the digital version of daylight sensor to be used on the lighting control system defined in specification 26 09 29.
C. Type B: On/Off Daylight Sensor
   1. Low voltage, ceiling-mounted daylight control device powered by 24 VDC supplied by power pack.
   2. Provide a closed oop device.
   3. Single / Multi zone control.
   4. Program with On and Off Setpoints and a delay of 5 minutes to avoid nuisance switching.
   5. Refer to Sequence of Operations for target light levels within each space.
   6. "/D" represents the digital version of daylight sensor to be used on the lighting control system defined in specification 26 09 29.

## 2.4 EMERGENCY LIGHTING CONTROL DEVICES

A. Acceptable Manufacturers
   1. LVS, Inc.
   2. Wattstopper.
   3. Nine 24, Inc.
   4. Cooper Controls
   5. Prior approved equal.
B. General:
   1. UL 924 listed and UL 94-VO or UL 94-5VA for flame rating and approved for installation above the suspended ceiling.
   2. Faceplate (if applicable) shall have silver finish with test switch, normal power indicating and emergency power indicating lights.
   3. Device shall monitor the unswitched portion of the circuit providing normal lighting to an area.
   4. Switch rating: 20 amps at 120V or 277V, 1800W Tungsten at 120V and 1500W Tungsten at 277V, 1 horsepower.

5. Flush mount in 4 11/16” deep box with extension ring.
6. Test Switch: Provide means of indicating emergency fixtures and device operability – whether onboard or device self-diagnostic. Remote test switch will be required if device does not have self-diagnostic test feature.

C. Emergency Power Control Device Types:
1. Type A: LVS #EPC-A-1. Single relay contact that provides On/Off control of the emergency lighting to match the normal lighting. When normal power fails, relay contact energizes emergency lighting, regardless of normal lighting switch position.
   a. During Normal Operation, Emergency fixtures switch with normal fixtures.
   b. During loss of normal power, emergency fixtures shall turn On.
2. Type B: LVS #EPC-1-D. Single relay contact that provides On/Off and 4-Wire dimming control of the emergency lighting to match the normal lighting. When normal power fails, relay contact energizes emergency lighting, regardless of lighting switch or dimmer position.
   a. Shall control 0-10V or DALI dimming fixtures.
      1). During Normal Operation, Emergency fixtures dim and switch with normal fixtures.
      2). During loss of normal power, emergency fixtures shall illuminate to 100%.
3. Type C: LVS #EPC-D-F. Single relay transfer device to switch power from the normal to emergency circuit when normal power fails. Once normal power returns, device shall return normal power circuit to fixtures.
   a. Shall control On/Off, 2- or 3-wire fluorescent line-voltage dimming fixtures or 4-wire low voltage dimmed fixtures.
      1). During Normal Operation, Emergency fixtures dim and switch with normal fixtures.
      2). During loss of normal power, emergency fixtures shall illuminate to 100%.
4. Type D: LVS #RRU-1. Single relay shunt device to bypass the emergency light control. When a local normal circuit fails, relay contact energizes emergency lighting regardless of lighting switch position.
   a. Type E: LVS #EPC-PM-A. Dual relay contacts that provide On/Off control of the emergency lighting to match the normal lighting. When normal power fails, relay contacts energizes emergency lighting regardless of normal lighting switch position. Shall have the ability to control both switch legs of a bi-level fixture when emergency lights are energized.
   b. 2 Amp load maximum rating.
   c. Consult Manufacturer for applications that require more than two fixtures to be controlled with Emergency power on common switch legs.
   d. Consult Manufacturer to verify ballast/driver compatibility with unit.

## 2.5 CIRCUIT CONTROL HARDWARE

A. WIRED
1. Control Units - For ease of mounting, installation and future service, control unit(s) shall be able to externally mount through a 2" knock-out on a standard electrical enclosure and be an integrated, self-contained unit consisting internally of an isolated load switching control relay and a transformer to provide low-voltage power. Transformer shall provide power to a minimum of two (2) sensors.
2. Relay Contacts shall have ratings of:
   13A - 120 VAC Tungsten.
   20A - 120 VAC Ballast.
   20A - 277 VAC Ballast.

## 2.6 CONTROL WIRING

A. WIRED

1. Control wiring between sensors and controls units shall be Class II, 18-24 AWG, stranded UL Classified, PVC insulated or TEFLON jacketed cable approved for use in plenums, where applicable.

## PART 3 EXECUTION

### 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Accept material on site. Inspect for damage.
B. Protect material from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

### 3.2 EXAMINATION AND PREPARATION

A. Verify that surfaces are ready to receive work.
B. Verify specified sensor will provide proper coverage of the room.

### 3.3 INSTALLATION

A. Do not install products until building is enclosed and tempered.
B. Maintain conditions to manufacturer's instructions during and after installation of occupancy sensor system.
C. It shall be the Contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The Contractor shall provide additional sensors if required to properly and completely cover the respective room.
D. Sensors shall be located so they are not affected by activities in corridors or adjacent rooms. Sensors which are activated by activity in adjacent rooms shall be relocated at no additional cost.
E. Install motion sensors 4-6 ft. away from ceiling air vents to eliminate potential false-triggers from HVAC system.
F. It is the Contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the owner's facility, to verify placement of sensors and installation criteria.
G. Install products and size conductors in accordance with manufacturer's instructions.
H. Provide 4 feet of slack cable at each sensor to allow field adjustment of sensor location.
I. All low voltage wiring shall be either installed in conduit or the cable may be installed without a raceway system if the cable has a plenum rated jacket and is installed in a neat and workmanlike manner. All wiring where not contained in conduits shall be firmly supported without resting on suspended ceilings and without being attached directly to electrical conduits, etc. Exposed cabling shall be supported by means of "D" rings or other approved cable suspension devices. When low voltage wiring is installed in conduit, utilize flexible metal conduit to ceiling mounted occupancy sensors to allow for repositioning.
J. EC shall install all powerpacks and auxiliary packs feeding area/space centralized over an entry door to the space, above an accessible ceiling, unless directed otherwise. Powerpack(s) shall be accessible with an owner’s standard-height maintenance ladder. EC shall label powerpacks with self-adhesive tape with panel and circuit supplying controller and area served by powerpacks).
K. Identification: Identify components and power and control wiring in accordance with Section 260553 “Identification for Electrical Systems”. Identify circuits or luminaires

controlled by occupancy sensors at each sensor.

L. Emergency Lighting Control Devices
   1. Coordinate exact location of device with Owner prior to rough-in.
   2. Install devices per manufacturer's instructions.
   3. Label device with Emergency/Life Safety panel and circuit information and normal sensing circuit and panel information.
   4. Verify proper operation of device.

## 3.4 FIELD QUALITY CONTROL

A. Perform operation test on completed installation to verify proper operation.
B. Replace equipment, components, and wiring which is proved to be defective.
C. System shall test free from grounds, shorts and open circuits.

## 3.5 ADJUSTMENT AND CLEANING

A. At substantial completion, clean all sensor lenses.

## 3.6 START UP/MANUFACTURER'S FIELD SERVICES

A. It shall be the Electrical Contractor's responsibility to verify all proper adjustments of occupancy/vacancy sensors, including sensitivity and time delay setting, and train their and the owner's personnel to ensure owner's satisfaction with the control system.
B. Upon completion of the installation, the daylight harvesting and/or wireless control system shall be completely commissioned by the manufacturer's factory authorized technician who will verify and document all adjustments and sensor placement to ensure a trouble-free sensor-based lighting control system.
C. The Electrical Contractor shall provide both the manufacturer and the electrical engineer with ten (10) working days' written notice of the scheduled commissioning date. Engineer's presence may be required to verify sensor calibration and programmed light levels during commissioning. Upon completion of the system fine tuning the factory authorized technician shall provide the proper training to the owner's personnel in the adjustment and maintenance of the sensors. The Electrical Contractor shall also provide the owner and engineer complete copies of all settings of all devices.

## 3.7 DEMONSTRATION AND TRAINING

A. Demonstrate modes of operation and required responses.

END OF SECTION

# SECTION 26 09 29 - DIGITAL DISTRIBUTED LIGHTING CONTROLS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Digital Lighting Control System
B. Distributed Controllers
C. Lighting Control Panel
D. Digital Luminaires
E. Low Voltage Devices
F. Accessories and Input/Output Interfaces
G. Network Interfaces

### 1.2 SYSTEM DESCRIPTION

A. Provide a complete, functional, intelligent, low-voltage lighting control system as indicated on the drawings and specified herein.
B. Where shown on the drawings, furnish and install a complete low-voltage, distributed lighting control system consisting of, but not limited to; controllers, enclosures, low voltage devices and miscellaneous components as required for a complete, operable lighting control system.
C. Component Testing: Individually testing of all system components and assemblies are required prior to assembly. Once assembled, all finished products to be tested for proper operation of all control functions per specifications prior to shipment.
D. Furnish products listed by Underwriters Laboratories, Inc. and/or the testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.
E. This specification is based on CAT5 interconnection. Alternative wiring topologies are acceptable if control system accomplishes all requirements specified in documents.
F. PROJECT SPECIFIC BASIS OF DESIGN:
   1. System to be a standalone series of distributed digital controllers, dedicated per Room or Area they are serving. All local devices shown in each area are connected together to its In-Room Network.
      a. All Suite areas of building utilize a digital distributed system except Electrical/Mechanical rooms or locations with single wallbox occupancy sensor switch.
   2. All switches can override the occupancy sensors and daylight sensors controlling the space. Program the daylight sensors to allow lighting to brighten 10% more than automatic sensor threshold from wall dimmers.
   3. During Normal Hours, program occupancy sensors to have a 20 minute time delay to off after no motion is sensed. During After Hours, program occupancy sensors to have a 10 minute time delay and switches to have a 1 hour timer.
   4. Utilize UL924 rated devices for emergency egress lighting in interior spaces As shown on drawings.
   5. Refer to Sequence of Operations in Schedules Sheets for control strategy information.

### 1.3 REFERENCES

A. ANSI/NFPA 70 - National Electrical Code.
B. ASHRAE 90.1 2013 – Energy Standard for Buildings (except Low Rise Residential Buildings)
C. IECC 2015 – International Energy Conservation Code
D. Wisconsin Safety and Professional Services Chapter 363.
E. LEED V4.0 – U.S. Green Building Council building standard

F. WELL V2 – International WELL Building Institute

## 1.4 SUBMITTALS

A. For Approval
   1. Shop Drawings: Submit complete factory generated drawings. Indicate wiring diagrams of all system components, showing interface with branch circuit wiring. Indicate all point-to-point wiring, including all control wiring between devices for typical instances.
   2. Provide individual submittal sheets for each unique controller, panel, sensor Type, etc. used on project.
      a. Provide lighting control panels as shown on drawings, Substituting distributed controls for LCP's is not acceptable.
   3. Provide a full layout of devices showing each Controller, Lighting Control Panel (if applicable), low voltage device, Network Accessory, interfaces, etc. for each Lighting Plan.
   4. Product Data: Provide data showing dimensions and ratings for components.
   5. All manufacturers to submit to the specifying engineer a line-by-line compliance comparison between each specifications requirement and the system being proposed.
   6. During submittal process, contractor to schedule an in-person meeting between Owner's representative, contractor, engineer, lighting designer, manufacturer's representative to clarify design intent, bill of materials, controls operations, etc.
      a. Bring any ambiguities in the drawings or specifications to the attention of the specifying engineer for clarification during this meeting.

G. For Record Purposes
   1. Test Reports: Indicate satisfactory completion of required tests and inspections.
   2. Record actual locations of equipment and show interconnecting wiring.
   3. Record programmed data for Owner reference. Data may include building schedule hours, room control strategy, low voltage device locations and programming details.

H. Operations and Maintenance Manuals
   1. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
   2. System Programming manuals: Include detailed instructions of all programming parameters available for standard operation of system with Technical Support contacts.
   3. Copy of submittal layout drawings with associated factory-supplied serial numbers, applied to Lighting plans required to be submitted with Record documents to identify types of devices, locations, addresses, etc. to aid with maintenance of control system.
   4. Maintenance Data: Include replacement part numbers.

## 1.5 EXTRA MATERIALS

A. Spare Materials
   1. Provide one (1) of each Distributed Controller type.
   2. Provide 5% added spare relays in each Lighting Control Panel.
   3. Provide two (2) of each switch type.
   4. Provide one (1) of each Low Voltage device.

B. Maintenance Materials
   1. None required.

## 1.6 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

B. Provide manufacturer's warranty covering 5 years on all Relay modules, Low voltage devices, and software defects. Manufacturer agrees to repair or replace any device that fails due to material or workmanship for a period of 5 years (minimum).

## PART 2 PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. The Wattstopper - DLM (Basis of Specification).
B. Acuity - N Light.
C. Hubbell – NX system.
D. Crestron – ZUM wired.
E. Lutron.
F. ETC – Echo.
G. Substitutions: Under provisions of Section 26 05 00.

### 2.2 GENERAL

A. Sequence of Operations: Input signal from field-mounted manual switches, or digital signal sources, programmed to open or close or dim one or more lighting control relays.. Any combination of inputs may be programmable to any number of control relays.
B. Furnish a complete system which accommodates the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, digital switches, digital daylighting sensors and accessories which suit the lighting and electrical system parameters.
C. Network Characteristics:
   1. In-Room Network
      The In-Room network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building.
      Automatic configuration and binding of occupancy & daylight sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
      Two-way communications for control by configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a low voltage device.
      Digital room devices connect to the In-Room network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices.
      Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable.
      Systems that utilize twisted low voltage pair cabling is not an approved system topology.
      Systems that utilize wireless communication between controllers and low voltage devices is not an approved system topology.
      If manufacturer's pre-terminated Cat 5e cables are not used for the installation, the contractor is responsible for testing each cable following installation and supplying manufacturer with test results.
   2. Global Network (In-Room to In-Room Network)
      The Global network is a linear topology to connect In-Room networks and relay panels (if applicable) for centralized control.
      Each connected In-Room Network includes a single network bridge, and the network bridge is the only room-based device that is connected to the Global Network.
      Network bridges, relay panels and Global Management Controller include terminal blocks, with provisions for separate "in" and "out" terminations, for network connections.

Utilize communications cabling as specified by the manufacturer. Meet manufacturer maximum limitation cable run for each segment (distance between In-Room Networks).
Network signal integrity requires that each conductor and ground wire be correctly terminated at every connected device.
Substitution of manufacturer-supplied cable must be pre-approved by manufacturer.

## 2.3 DISTRIBUTED CONTROLLERS

A. General:
1. Digital controllers for lighting automatically bind all room loads to the connected low voltage devices in the space. The controllers are simple to install, and do not have dip switches or potentiometers, or require special configuration. The control units include the following features:
   Standard junction box mounting
   Low voltage connection using standard RJ-45 CAT5e cable.
   Automatic room configuration
   Each connected load is capable of any of the following behaviors; Automatic On or Manual On operation, Turn on to Preset level or last level set.
2. UL 2043 plenum rated.
3. Manual override and LED indication for each load
4. Dual voltage (120/277 VAC, 60 Hz), or 347 VAC, 60 Hz (selected models only). 120/277-volt models rated for 20A total load, derating to 16A required for some dimmed loads (forward phase dimming); 347-volt models rated for 15A total load; plug load controllers carry application-specific UL 20 rating for receptacle control.
5. Zero cross circuitry for each load.
6. All digital parameter data programmed into an individual room controller or plug load controller to be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.
7. Do not wire controllers in line with a relay-controlled circuit to maintain constant power at all times. Continuous switching of power to the powerpack and auxiliary pack may result in loss of programming or shortened device lifespan.

B. On/Off Room Controllers include:
1. Minimum efficient 150 mA switching power supply
2. RJ-45 ports with integral strain relief and dust cover

C. On/Off/Dimming Room Controllers include:
1. Real time current monitoring
2. Multiple relay configurations per unit
3. Each dimming output channel is independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver
4. Minimum efficient 250 mA switching power supply
5. One dimming output per relay
   0-10V Dimming:
   1). Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output automatically opens upon loss of power to the Controller to assure full light output from the controlled lighting.
   Line Voltage, Forward Phase Dimming:
   2). Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward phase compatible ELV, neon/cold cathode and incandescent loads.
6. Each load to have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events.

## 2.4 LIGHTING CONTROL PANEL(S)

A. Programmable lighting controllers contain a single enclosure with incoming branch circuits, relays, dimming modules, contactors, on-board timing and control unit, and other devices of the sizes and quantities indicated on the drawings and specified herein.

B. Hardware Features:
   1. Controller Back-Box: Each programmable lighting controller provided with a factory furnished; UL listed NEMA 1 enclosure designed for wall mounting, unless noted otherwise. Back-box must be capable of being shipped ahead of controller chassis insert to allow for rough-in of all electrical connections prior to receipt of the controller chassis insert.
   2. Line Voltage / Control Voltage Separation: Each programmable lighting controller to be provided with a mechanical barrier that separates all line voltage components and wiring from all control voltage components and wiring.
   3. Provide line voltage barriers between each power source within lighting control panel. Examples include normal power, emergency power, life safety power, and critical care power. Review Lighting Control Panel Schedule for additional information.

C. Electrical:
   1. Controller Power Supply: Provide each programmable lighting controller with a dual-rated, UL listed Class 2 transformer capable of either 120 or 277 VAC primary (50 to 60 Hz). Transformers to contain an internal self-resetting fuse.
   2. NFPA 70, Class 2, sized for connected equipment, plus 20 percent spare capacity. Powered from a dedicated branch circuit of the panelboard that supplies power to the line side of the relays, sized to provide control power for the local panel-mounted relays, bus system, low-voltage inputs, field-installed occupancy sensors, and photo sensors.
   3. Connections: Make all connections clearly and permanently labeled at termination points.

D. Controller Electronics:
   1. Controller CPU: Each programmable controller to be provided with a CPU (Central Processing Unit) that provides all the programming and control functions for the entire controller. CPU to be protected against loss of memory during a power outage through nonvolatile RAM for a period of up to 7 days without loss of programming.
   2. Real-Time Clock: Perform all time-controlled functions. Clock accuracy displayed to the minute. Programmable intelligence includes: 365-day calendar, astronomical timeclock, auto adjustments for daylight savings and leap year.
      Scheduling: Minimum of 16 scheduled events including Holiday schedules with periods scheduled to the minute, day-of-week, day-of-month, day-of-year with one-time or repeating capability.
      Warn Off: Flash lights prior to scheduled-off.
      Preset: Pre-programmed switch patterns and scenes.
      Timed Inputs & Overrides: Timed override 1-120 minutes, resumes to normal schedule
      Priorities: Establishes a hierarchy for inputs and network control commands.
      Global Linking: Each panel shall be capable for network linking of control commands from low voltage inputs.
      Fade Rates available for dimming channels, both On and Off commands.
   3. Communications & Programming: Accomplished through either a RS-232 port (via laptop computer), through the network connection (Modem or TCP/IP), or with an integral LCD display and programming keypad.
   4. The lighting control system to be capable of logging control events for one month. The controller will monitor all relay actuations, switch inputs and user intervention. Log reports shall be available for any duration of time the operator chooses through the Software.

E. Switching Inputs:

1. Each input to have a unique address and capable of being programmed to the applicable functions for each Switched or Dimmed Input Types. Input Types include but are not limited to; Momentary On/Off, Momentary Push Button, Maintained On/Off, Timed On/Off, Override Time Delay, Raise/Lower, Preset etc. or a combination of these.
2. Switch Stations: Digital switch stations to be available in momentary push button style (multiple button configurations per single gang station). The switch pilot lights programmed to track the status of relays, relay groups, and presets.
3. Photocells: The photocell to be provided with light to dark levels (0- 1800fc) and have a settable filter. Photocell capable to be programmable to any relay(s) on the network.
4. Dry Contact/Switch Input Card: The module provides a minimum of 8 inputs that accept momentary, momentary push button and maintained switch closures. Each input may control any or all of the relays in the lighting controllers on the network. Card can support low voltage switches, photosensors, and motion sensors, or their logical equivalents.
   a. Fire Alarm System Inputs: Dry Contact /Input Card to allow inputs from fire alarm control systems and program them to perform any of the available switch input functions.
   b. BAS System Inputs: Dry Contact /Input Card to allow inputs from BAS control system and program them to perform any of the available switch input functions.

F. Diagnostic Aids: Each programmable lighting controller shall be provided with an LED that indicates that the main power supply is present and operational. Each relay output to have an LED pilot to indicate the current status of all controlled relay outputs.

G. Data Protection and Storage: All programmed data stored in nonvolatile RAM to protect all stored programming data from loss during a power outage for a minimum period 10 days without power of any type.

H. Relay Groups: The controller supports the grouping of individual relay outputs and be controlled network wide. These groups may be controlled by switch or time-based signals.

I. Switch Input Active Times: The system supports the ability to enable/disable switch inputs according to a user-defined set of times.

J. Descriptive Names: The system to allow the optional assignment of descriptive names (up to 10 characters) to the lighting controller, relay outputs, relay groups, inputs, timers, presets, switches, sensors and other low voltage devices.

## 2.5 LIGHTING CONTROL RELAY MODULES

A. Switching Modules
1. Latching Relay: Utilize latching relays that are rated to 20 amps at 120/277 VAC. The relays to be mechanically held. Relays to provide an integral switch for both manual hand operation and visual indication of relay status. The wire terminations sized to accept 6 AWG wire. Relay rated for 10 million mechanical operations.
2. Two Pole Relay: Provide an option of two pole relays in voltages such as 208, 240, and 480 VAC lighting loads at 20 amps. The relays are modular in design and offer manual hand override control. The wire terminations sized to accept 12 AWG. Relay rated for 10 million mechanical operations. Manufacturer to determine size of panels/cards needed per Relay Panel Schedule to accommodate size of relays.
3. Provide override switch on individual relays for manual control on/off.

B. Dimming Modules
1. Class 2 lighting control modules individually UL and CUL listed and bear labels indicating compliance.
2. Utilize latching relays that are rated to 20 amps at 120/277 VAC. The relays to be mechanically held. Relays to provide an integral switch for both manual hand operation and visual indication of relay status. The wire terminations sized to accept 6 AWG wire. Relay rated for 10 million mechanical operations.
3. Dimming modules: 0 - 10V dimmable fluorescent ballast or LED driver: Up to 50

ballasts/drivers per associated switching relay.

4. All channels to support On/Off and Dimming Control.

## 2.6 LOW VOLTAGE DEVICES

A. Digital Motion Sensors

1. Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic or passive infrared and microphonics).
2. Digital Sensors includes graphic LCD display for digital calibration and electronic documentation. Features include the following: Sensitivity, Time Delay, Detection Technology, and Walk-Through Mode.
3. Each sensor may be programmed to control specific loads within an In-Room network.
4. Dual Technology Sensors shall have independent configurable trigger modes to choose proper technology according to space use to eliminate false-triggers.
5. One or two RJ-45 port(s) for connection to In-Room network.
6. Two-way infrared transceiver to allow remote programming through handheld commissioning tool.
7. Refer to Spec 26 09 23 for sensor Types.
   a. Confirm quantity and provide appropriate coverage of sensor per space requirements. Symbols on drawings are diagrammatic and represent design intent only.

B. Digital Switch Stations

1. General: Low voltage momentary pushbutton switches shall be provided in minimum configurations of 4 buttons per station.
2. Provide pilot-light per each button. Pilot light indicates true relay status.
3. Buttons may be programmed as On/Off, On-only, Off-only, Raise or Dim, group or scene control.
4. Switch buttons may be bound to any load on lighting control system and are not load type dependent. 3-way, 4-way switch locations are supported for On/Off or Dimming control.
5. Use Manufacturer's suggested bus wire or cable for digital switch network.
6. Digital switch(es) shown on floor plan are diagrammatic to show intent of control zones and locations of control devices. A multiple-button switch may be used to reduce quantity of single-gang switches, as long as individual control of zones area maintained. Engineer to approve all button configurations at time of Submittals. EC to review submitted device layouts from manufacturer prior to rough-in for determining appropriate back box sizes.
7. For each dimmer switch symbol shown, provide one single-gang dimming station for indicated load control.
8. Dimmer switch shall be able to be ganged with multi-button switches under the same wallplate.
9. Provide labeling for each button on switch station. Contractor to verify labeling with Owner prior to substantial completion.
   a. Labeling to be applied at factory, permanently to each button. Field-applied labels with adhesive is not an acceptable means of installation.
   b. Engraved buttons should be field replaceable without requiring removal of device or rewiring. Engraving of switch station buttons to be completed nearing the end of construction. Engraving kits shall not delay the shipping of switch station devices needed for rough-in and installation.
   c. Provide engraved switch stations in public areas of the building only.
10. Refer to Wiring Device Specification 26 27 26 for device and faceplate finish.
11. Refer to Plans for configurations and quantities of switches. Refer to Low Voltage Switch Station Schedule for button programming requirements and configurations.

C. Touch Panel Controls
   1. Preset lighting scene controllers.
   2. Electrical:
      a. Input: 24VDC
      b. Remote Power Supply: 120/277V AC
      c. RS-485 network terminal
      d. In-Room digital system enabled RJ-45 ports (in/out)
      e. CAT5e Ethernet network terminal
      f. DMX/RDM network terminal
   3. Mounting: Installs in a standard triple gang US back box
   4. General Requirements:
      a. 7” full color multi-touch capacitive touchscreen for controlling lighting and system components
      b. Control up to 36 dynamic lighting zones/scenes per touch screen
      c. Lighting zones/scenes can be comprised of lighting intensity, color, color temperature, and luminaire position
      d. Modify color and color temperature using a digital color palette and UV rating scale
      e. Proximity screen sensor for auto “wake-up”
      f. Auto dimming and user adjustable backlight
      g. User programmable screen lock limiting access to all feature control and programming
      h. Full alpha-numeric scene and zone naming
      i. Configurable interface to reflect project requirements
      j. Lighting zones/scenes support control of forward/reverse phase dimming, 0-10v, RGB, enabled luminaires, In-Room controllers, DALI, tunable white and moving fixtures
      k. Integral astronomical time clock enables lighting scenes
      l. Partition status control and visualization
      m. Direct DMX control for a single universe (512 slots)
      n. RS-232/contact closure capable for 3rd party integration
D. Digital Daylight Sensors
   1. General
      a. Lighting control set points/ranges are based on two lighting conditions:
         1). When no daylight is present.
         2). When significant daylight is present (target level).
      b. Digital daylighting sensors work with room controllers to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to a room controller.
      c. Daylight sensors to have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.
      d. Provide adjustable cut-off time (0-120 minute minutes). Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off.
      e. Optional wall switch or dimmer override allows occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise lighting levels for a selectable period of time or cycle of occupancy.
   2. Definitions:
      a. Closed Loop: Sensor that is positioned in the space/zone it is controlling, measuring both natural and artificial light contribution.
      b. Open Loop: Sensor that is positioned near fenestration, aimed outside, measuring only natural light contributing to the space.
   3. General Sensor Light-Level Monitoring Ranges:
      a. General Space Sensors: 10 to 200 fc with an adjustment for turn-on and turn-off levels within that range.
      b. Atrium Space Sensors: 100 to 1000 fc, with an adjustment for turn-on and turn-off levels within that range.

c. Skylight Sensors: 1000 to 10,000 fc, with an adjustment for turn-on and turn-off levels within that range.

4. Type A/D: Dimming (0-10V) Daylight Sensor
   a. Low voltage, ceiling-mounted daylighting control device, powered by 24 VDC supplied by In-Room controller or lighting control panel.
   b. Provide dimming over the full range from .2VDC to 10VDC.
   c. Provide a closed / open loop device.
   d. Single / Multi zone control.
   e. Capable of controlling up to 50 standard 0-10VDC electronic dimming ballasts or drivers.
   f. Refer to Sequence of Operations for target light levels within each space.
5. Type B/D: On/Off Daylight Sensor
   a. Low voltage, ceiling-mounted daylight control device powered by 24 VDC supplied by In-Room controller or lighting control panel.
   b. Provide a closed / open loop device.
   c. Single / Multi zone control.
   d. Program with On and Off Setpoints and a delay of 5 minutes to avoid nuisance switching.
   e. Refer to Sequence of Operations for target light levels within each space.

## 2.7 ACCESSORIES AND INPUT/OUTPUT INTERFACES

A. Configuration Tools
1. Provide two Configuration Tools for the project (if system is not programmed via Smart Device/App)
2. A wireless configuration tool facilitates optional customization of In-Room networks using two-way infrared communications,
3. Features and functionality of the wireless configuration tool include but not be limited to:
   a. Two-way infrared (IR) communication with IR-enabled devices within a range of approximately 30 feet.
   b. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
   c. Must be able to read and modify parameters for room controllers, occupancy sensors, wall switches, daylighting sensors, network bridges and relay panels, and identify room devices by type and serial number.
   d. Adjust or fine-tune daylighting settings established during auto-configuration and input light level data to complete configuration of open loop daylighting controls.
4. Provide free, downloadable PC software and USB interface for direct programming of In-Room Networks.

B. Interface Modules
1. Operates on Class 2 power supplied by In-Room network.
2. Status LEDs under hinged cover indicate if input is energized.
3. Two RJ-45 ports for connection to In-Room Network.
   a. Switched Contact Closure Interface
      1). Utilized for automatic control via input from switches or relay-based system.
      2). Includes 24VDC output and three input terminals for momentary or maintained third party contact closure inputs.
      3). Utilize input module for an Auto On and Sweep off function from the lighting control panel for the [AREA]. During normal hours of operation, all local low voltage devices are fully operational. During after hours, apply a timer to all low voltage switches or dimmers so that the room will automatically sweep off every two hours following switch activation. Provide a blink warn to alert occupants of impending Off.
   b. Serial Data Interface

1). Utilized for control from A/V system to send On/Off/Preset commands to In-Room Network.
2). Includes 24VDC output and 10 pin RS232 connection.
3). Coordinate programming with the Manufacturer technician and the A/V system technician for successful interface between both systems.

## 2.8 NETWORK INTERFACES

A. General
1. For networked applications, include at least one Global Management Controller to manage network communication. Controller to be capable of serving up a graphical user interface via a standard web browser utilizing either unencrypted TCP/IP traffic via a configurable port or 256 bit AES encrypted SSL TCP/IP traffic via a configurable port.
2. Each Global Management Controller supports direct-wired network per floor or network switches that connect multiple areas/floors back to central controller. Each direct-wired network may alternately be connected to the Global Management Controller via external routers and switches, using standard Ethernet structured wiring. Each router accommodates direct-wired network. Provide the quantity of routers and switches recommended by Manufacturer for proper Network connectivity.
3. Connection to PC or LAN via standard Ethernet TCP/IP via standard Ethernet TCP/IP with the option to use SSL encrypted connections for all traffic.
4. Easy to learn and use graphical user interface, compatible with current internet browsers, stored on cloud-based servers. Does not require installation of any lighting control software to an end-user PC.
5. Log in security capable of restricting some users to view-only or other limited operations.
6. Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation including sensor time delays and sensitivities, and load response to sensor including Manual-On or Auto-On.
7. Ability to set up schedules for rooms and panels, view and override current status of panel channels and relays and assign relays to groups. Schedules automatically set controlled zones or areas to either a normal hours or after hours mode of operation. Support for a minimum of 50 unique schedules, each with up to four time events per day. Support for annual schedules, holiday schedules and unique date-bound schedules.
8. Ability to group rooms and loads for common control by schedules, switches or network commands.
9. Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.

B. Global Network Bridge
1. Provide one bridge per In-Room Network within defined Networked Rooms.
2. Utilize manufacturer specified network cable to daisy-chain all network bridges.
3. The Global Network bridge module connects an In-Room Network to a Segment Network (direct-wired) for communication between rooms, relay panels and the Global Management Controller.
4. The network bridge provided as a separate module connected on the In-Room Network through an available RJ-45 port.
5. If a network bridge loses communication with the Global Network, In-room network stays active and operate as normally programmed. There shall be no disruption to local control.

C. Global Management Controller
1. Provide appropriately - sized Controller and quantities per Scope of Project, as recommended by manufacturer.
2. Provide all necessary network components, i.e. routers, switches, repeaters, etc. as

suggested by manufacturer for a full complete Networked System.

3. After In-Room Network discovery, all rooms and panels are presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.
4. Ability to view and modify room device operational parameters. Set device parameters independently for normal hours and after hours operation including sensor time delays and sensitivities, and load response to sensor including Manual-On or Auto-On.

D. Cable
1. Utilize Manufacturer-specified cables (or Manufacturer's approved equivalent) for In-Room Networks.
2. Utilize Manufacturer-specified network cable for Segment Network. Substitutions of network cable only allowed with prior written approval from Manufacturer.

## PART 3 EXECUTION

### 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Do not ship equipment to site until the building is weather tight.
B. Accept material on site. Inspect for damage.
C. Store equipment as recommended by the manufacturer.
D. Protect material from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

### 3.2 EXAMINATION AND PREPARATION

A. Verify that surfaces are ready to receive work.
B. Verify field measurements are as shown on Drawings and/or as instructed by the manufacturer.
C. Verify that required utilities are available, in proper location, and ready for use.
D. Beginning of installation means installer accepts conditions.
E. Examine areas to receive cabinets to assure adequate working clearance for cabinet installation.

### 3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Use 20 AWG, minimum, stranded copper conductor building wire in conduit for low voltage wiring in walls, above inaccessible ceilings, and where run exposed. Use remote control and signal cable suitable for purpose above accessible ceilings.
C. Provide plenum-rated cabling for above ceiling wires located in a forced-air plenum space.
D. Install relay cabinets to be accessible. Allow space for adequate ventilation and circulation of air. Lighting control system components shall only be installed in spaces that meet the following environmental conditions:
1. Temperature: 32 – 104 deg F (0 - 40 deg C).
2. Relative Humidity: 10 – 90 percent, noncondensing.
E. All stored and installed lighting control system components shall be adequately protected from dust and dirt.
F. Provide typed circuit directory for each LCP. The directory to accurately indicate the panelboard and circuit being controlled, groups of luminaires served and the rooms in which the luminaires are located. Designate rooms and panelboards by the actual name or number designated by the Owner.
G. For each In-Room network of distributed controllers, install all controllers feeding area/space centralized over an entry door to the space, above an accessible ceiling, unless directed otherwise. Controllers to be accessible with an owner's standard-height

maintenance ladder. Label controllers with self-adhesive tape with panel and circuit supplying controller and area served by controller(s).

H. Where applicable, mount UL924 emergency control devices adjacent to In-Room controllers, labeled with Emergency Panel and circuit information and normal sensing circuit information.

## 3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 40 00 and 16010.
B. Perform operation test on completed installation to verify proper operation.
C. Replace equipment, components, and wiring which is proved to be defective.
D. System required to test free from grounds, shorts and open circuits.

## 3.5 ADJUSTMENT AND CLEANING

A. Adjust work under provisions of Section 01 65 00 and 26 05 00.
B. Adjust system to accomplish proper system operation.
C. At substantial completion, clean all applicable sensor lenses and switch faceplates.

## 3.6 START UP/MANUFACTURER'S FIELD SERVICES

A. Installation Assistance: During the installation process, the manufacturer provides, at no cost, technical support via a toll-free telephone line to the installing contractor to answer questions and supply additional information when required.
B. Pre-Wire Meeting; Include as part of the base bid for Lighting Control Manufacturer to conduct on-site meeting prior to commencing work. Manufacturer to review with installer:
   1. Low voltage wiring requirements, wireless hub locations and installation, sensor locations to be reviewed in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated, computer jack locations, network wiring requirements, connections to other equipment installer responsibilities.
   2. Sequencing: Do not install sensors and wall controls until final surface finishes are complete.
C. Systems Integration: Electrical Contractor to coordinate meeting between Owner Representative, Facility Group, Lighting Control System Manufacturer, and other related equipment manufacturers to discuss equipment and integration procedures.
D. System Start-Up: The system manufacturer shall provide a factory authorized field engineer to the project site after installation has been completed and prior to system energization for the purpose of testing and adjustment of the system. Factory field engineer to test and verify all system functions and ensure proper operation of the system components in accordance with the specifications and on-site conditions. Notify the system manufacturer in writing that the system is completely wired and ready to be energized and tested 3 weeks prior to scheduling a field engineer for start-up of the system. Should the field engineer arrive on the job site and find the installation incomplete, the installing contractor is responsible to pay the cost of any future visits by the field engineer required to complete the system start-up.
E. At Substantial Completion, update software to latest version. Upgrading software includes operating system and new or revised licenses for using software.
F. On-Site Programming: During the start-up procedure, the factory field engineer provides programming assistance and guidance to the building operating personnel in order to program and maintain the systems for continued operation.
   1. Contractor is responsible for coordinating all programming parameters of System devices, schedules, and interfaces with the Owner prior to on-site programming. Inability to determine programming sequences prior to site visit may result in future

visits by the field engineer. Cost of future visits is the responsibility of the Contractor.

2. Provide a minimum of 2 days for Startup of System.
3. Factory field technician to rename all connected digital devices with description of Type and Space it controls.
   a. For example, a two-button switch in an office space; device labeled for area switch station is serving (i.e., Office 101) and each button shall be identified for zone it controls, i.e. daylight, general. Confirm renaming scheme with facility personnel at time of programming.
   b. Once all devices are discovered and identified by field technician, owner's facility personnel and Electrical Contractor to be present during basic programming setup as part of training process.

## 3.7 DEMONSTRATION AND TRAINING

A. Provide systems demonstration by a fully qualified, trained representative of the equipment supplier.

B. Instruct Facility Personnel group and Electrical Contractor in the proper operation and maintenance of lighting control system 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 and shutdown procedures for all equipment. Demonstrate normal and abnormal modes of operation. Demonstrate methods to correct abnormal modes of operation. All training to be conducted during normal working hours.
   1. Processes to be reviewed include; discovering devices, locating devices, understanding topology of control system, maintaining IP connection to building LAN via hardwire or VPN access, associating control zones to devices, updating Scenes/Presets, recalibrating daylight sensors, etc.
   2. It is up on factory field technician to further review additional product specifics with facility personnel and owner rep to best understand system.

C. Instruct User group and the Facility's group in the proper operation of lighting control system provided as part of this project. Include not less than 2 hours of instruction, using the installed controls, typical operating practices, and reviewing any and all scheduling during this instruction to provide Users was familiarity of system. Demonstrate normal and abnormal modes of operation. All training to be conducted during normal working hours.

D. Electrical Contractor is responsible for notifying all parties of training and coordinate scheduling with facility group, owner, owner's rep, etc. with the factory representative and factory field technician so all parties are present at time of training.

END OF SECTION

# SECTION 26 22 14 - DRY TYPE TRANSFORMERS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. General purpose dry type transformers.
B. Energy efficient dry type transformers.

### 1.2 SYSTEM DESCRIPTION

A. Provide the dry type transformers as indicated on the drawings and specified herein.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.
B. See the one-line diagrams for specific features required for this project.

### 1.4 SUBMITTALS

A. For Approval
   1. Product Data: Provide outline and support point dimensions of enclosures and accessories, unit weight, voltage, KVA, and impedance ratings and characteristics, tap configurations, insulation system type, and rated temperature rise.
   2. Test Reports: Indicate loss data, efficiency at 25, 50, 75 and 100 percent rated load, and sound level.
   3. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.
B. For Record Purposes
   1. Indicate which tap is currently connected in all transformers.
C. Operations and Maintenance Manuals
   1. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

### 1.5 EQUIPMENT DIMENSIONS

A. Refer to floor plan drawings for approximate overall dimensions for the equipment of this section. Minor dimensional increases of 6 inches or less are acceptable unless specific dimensions are indicated for the equipment. Notify the engineer in writing 5 days prior to submitting bid if the dimensional increases will be greater than 6 inches in any dimension.

### 1.6 EXTRA MATERIALS

A. Spare Materials
   1. None required.
B. Maintenance Materials
   1. None required.

### 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Square D.
B. ABB.
C. Siemens.
D. Eaton.

### 2.2 GENERAL PURPOSE DRY TYPE TRANSFORMERS

A. Description: NEMA ST 20, factory-assembled, air cooled dry type transformers, ratings as indicated with a K-1 rating.
B. Insulation system and average winding temperature rise for rated KVA as follows:
   1. 1-15 KVA: Class H with 115 degrees C. rise.
   2. 16-500 KVA: Class H with 115 degrees C. rise.
   3. Transformer coils shall be of the continuous wound type and shall be impregnated with a non-hygroscopic, thermosetting varnish.
C. Case temperature: Do not exceed 35 degrees C. rise above ambient at warmest point.
D. Winding Taps:
   1. Transformers Less than 15 KVA: Two 5 percent full capacity taps on primary winding below rated voltage.
   2. Transformers 15 KVA and Larger: Six 2 1/2 percent full capacity taps on primary winding, 2 above and 4 below rated voltage.
E. Sound Levels: Maximum sound levels are as follows:
   1. 0 to 9 KVA - 40 dB.
   2. 10 to 50 KVA - 45 dB.
   3. 51 to 150 KVA - 50 dB.
   4. 151 to 300 KVA - 55 dB.
   5. 301 to 500 KVA - 60 dB.
   6. 501 to 700 KVA - 62dB.
   7. 701 to 1000 KVA - 64 dB.
F. Basic Impulse Level: 10 KV.
G. All cores to be constructed with low hysteresis and eddy current losses. The core flux density shall be well below the saturation point to prevent core overheating. The complete core and coil shall be bolted to the base of the enclosure, but isolated by means of rubber vibration-absorbing mounts.
H. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding conductor sized in accordance with applicable UL and NEC standards.
I. Coil Conductors: Aluminum, continuous windings with terminations brazed or welded.
J. Enclosure: NEMA ST 20; Type 1. The transformer enclosures shall be ventilated and fabricated of heavy gauge sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of a polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49. Provide lifting eyes or brackets.
K. Mounting: Suitable for wall, floor, or trapeze mounting, except transformers larger than 75 KVA, suitable for floor or trapeze mounting.
L. Nameplate: Include transformer connection data; KVA, primary and secondary voltage ratings; percent impedance and overload capacity based on rated allowable temperature rise.

## 2.4 ENERGY EFFICIENT TRANSFORMERS

A. Description: NEMA ST 20, factory-assembled, air cooled dry type transformers, ratings as indicated with a K-1 rating.

B. Transformers shall be low loss type with minimum efficiencies per DOE 2016 standards when operated at 35% of full load capacity. Efficiencies shall be tested in accordance with NEMA TP-2.

C. Efficiency Ratings:

| Single Phase | | Three Phase | |
|---|---|---|---|
| KVA | Efficiency | KVA | Efficiency |
| 15 | 97.7 | 15 | 97.89 |
| 25 | 98.0 | 30 | 98.23 |
| 37.5 | 98.2 | 45 | 98.40 |
| 50 | 98.3 | 75 | 98.60 |
| 75 | 98.5 | 112.5 | 98.74 |
| 100 | 98.6 | 150 | 98.83 |
| 167 | 98.7 | 225 | 98.94 |
| 250 | 98.8 | 300 | 99.02 |
| 333 | 98.9 | 500 | 99.14 |
| | | 750 | 99.23 |
| | | 1000 | 99.28 |

D. Insulation system and average winding temperature rise for rated KVA as follows:
   1. 15 KVA and larger: Rated for 220 degree C UL Component Recognized insulation system, 150 degrees C. rise above a 40 degree C ambient.
   2. Transformer coils shall be of the continuous wound type and shall be impregnated with a nonhygroscopic, thermosetting varnish.

E. Case temperature: Do not exceed 50 degrees C. rise above ambient at warmest point.

F. Winding Taps:
   1. Transformers Less than 25 KVA: Two 5 percent full capacity taps on primary winding below rated voltage.
   2. Transformers 25 KVA and Larger: Six 2 1/2 percent full capacity taps on primary winding, 2 above and 4 below rated voltage.

G. Sound Levels: Maximum sound levels for 150 degree C Rise are as follows:
   1. 0 to 45 KVA - 40 dB.
   2. 46 to 112.5 KVA - 45 dB.
   3. 113 to 150 KVA - 47 dB.
   4. 151 to 300 KVA - 49 dB.
   5. 301 to 750 KVA - 58 dB.
   6. 751 to 1000 KVA - 60 dB.

H. Sound Levels: Maximum sound levels for 80 degree C Rise are as follows:
   1. 0 to 30 KVA - 40 dB.
   2. 31 to 75 KVA - 45 dB.
   3. 76 to 112.5 KVA - 47 dB.
   4. 113 to 225 KVA - 49 dB.
   5. 226 to 300 KVA - 56 dB.
   6. 301 to 500 KVA - 58 dB.

I. Basic Impulse Level: 10 KV.

J. All cores to be constructed with low hysteresis and eddy current losses. The core flux density shall be well below the saturation point to prevent core overheating. The complete core and coil shall be bolted to the base of the enclosure, but isolated by means of rubber vibration-absorbing mounts.

K. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding conductor sized in accordance with applicable UL and NEC standards.

L. Enclosure: NEMA ST 20; Type 1. The transformer enclosures shall be ventilated and fabricated of heavy gauge sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning, and phosphatizing, followed by electrostatic deposition of a polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49. Provide lifting eyes or brackets.
M. Mounting: Suitable for wall, floor, or trapeze mounting, except transformers larger than 75 KVA, suitable for floor or trapeze mounting.
N. Coil Conductors: Aluminum, continuous windings with terminations brazed or welded.
O. Nameplate: Include transformer connection data; KVA, primary and secondary voltage ratings; percent impedance and overload capacity based on rated allowable temperature rise.

## 2.5 OPTIONS

A. The accessories below apply to each transformer as indicated on the one-line diagrams.
   1. OPTION 1:
      a. Non ventilated enclosure.
   2. OPTION 2:
      a. Integral strip heaters: 120V 250W with thermostat.
   3. OPTION 3:
      a. Weathershield to upgrade enclosure to a NEMA 3R rating.

# PART 3 EXECUTION

## 3.1 DELIVERY, STORAGE, AND HANDLING

A. Deliver transformers individually wrapped for protection and mounted on shipping skids.
B. Accept transformers on site. Inspect for damage.
C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
D. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

## 3.2 EXAMINATION AND PREPARATION

A. Examine areas and conditions under which transformers are to be installed and notify Engineer, in writing, of conditions detrimental to proper and timely completion of work.
B. Do not proceed with work until unsatisfactory conditions have been corrected.
C. Provide 3 1/2" high concrete pad under floor mounted transformers.

## 3.3 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.
B. Set transformer plumb and level.
C. Use flexible conduit, under the provisions of Section 26 05 31, 2 ft (0.6 M) minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
D. Release resilient mounts in transformer enclosure. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.
E. Provide grounding and bonding in accordance with Section 26 05 26.
F. Provide engraved plastic nameplates under provisions of Section 26 05 53.

## 3.4 FIELD QUALITY CONTROL

A. Field testing will be performed under provisions of Section 26 08 11.
B. Check for damage and tight connections prior to energizing transformer.
C. Measure primary and secondary voltages and make appropriate tap adjustments.

## 3.5 ADJUSTMENT AND CLEANING

A. Adjust voltage taps for required system voltage and check grounding requirements.
B. Tighten lugs and bus connections.
C. Clean interior of equipment.
D. Sand, prime and paint scratched or marred surfaces to match the original finish.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.7 DEMONSTRATION AND TRAINING

A. Demonstrate changing of transformer taps.

END OF SECTION

# SECTION 26 24 16 - PANELBOARDS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Power panelboards.
   1. Circuit Breaker Type
   2.
B. Branch circuit panelboards.

### 1.2 SYSTEM DESCRIPTION

A. Provide the power and branch circuit panelboards as indicated on the drawings.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For Approval
   1. Shop Drawings shall indicate outline and support point dimensions, component list, conduit entry/exit locations, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
B. For Record Purposes
   1. As-built/Record Drawings shall accurately indicate the location of the equipment and the equipment shall be identified with the final designation as directed by the Owner.
C. Operations and Maintenance Manuals
   1. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.
   2. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

### 1.5 EQUIPMENT DIMENSIONS

A. Refer to floor plan drawings for approximate overall dimensions for the equipment of this section. Minor dimensional increases of 6 inches or less are acceptable, unless specific dimensions are indicated for the equipment. Notify the engineer in writing 5 days prior to submitting bid if the dimensional increases will be greater than 6 inches in any dimension.

### 1.6 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2 PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

A. Square D.
B. ABB.
C. Siemens.
D. Eaton.

## 2.2 POWER PANELBOARDS

A. Circuit Breaker Type:
   1. Circuit Breaker Panelboards: NEMA PB 1, 22,000 RMS symmetrical amperes minimum at 250 volts AC or 18,000 RMS symmetrical amperes minimum at 480 volts AC or as specified on the drawings. Equivalent to Square D I-Line.
B. Service Conditions:
   1. Temperature: 104 degrees F, 40 degrees C.
   2. Altitude: 1000 feet.
C. Panelboard Bus:
   1. Plated Copper ratings as indicated. The panelboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements.
   2. Provide ground bus in each panelboard.
   3. Provide neutral bus where required by the utilization voltage.
   4. Circuit breakers requiring intermediate bussing between the main vertical bus and the circuit breaker are not acceptable.
   5. Main Lug Only Panels: UL listed for type and temperature rating of wire specified.
D. Indoor Enclosure: NEMA PB 1, Type 1. Minimum cabinet box dimensions: 6 inches deep; 20 inches wide.
E. Cabinet Front: Flush or surface type, hinged one-piece with door, fastened with concealed hardware and trim clamps. Provide concealed hinged door with flush lock. Finish in manufacturer's standard gray enamel.
F. Nameplates:
   1. Manufacturer’s nameplate, located on panel interior front, shall contain system information (such as but not limited to voltage and current ratings) and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and Short Circuit Current Rating including series rating. When Series rating method is acceptable as indicated on the One Line diagram, Series rating information shall be:
      a. Size and type of upstream device.
      b. Branch devices that can be used.
      c. UL series short-circuit rating.
   2. Refer to specification section 26 05 53 for additional nameplate requirements.

## 2.3 BRANCH CIRCUIT PANELBOARDS

A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1, circuit breaker type.
B. Panelboard Bus:
   1. Plated Copper, ratings as indicated.
   2. Provide ground bus in each panelboard.
   3. Provide split neutral bus where required by the utilization voltage. Neutral bus shall be located in the mains compartment for incoming neutral conductors to be the same length.
   4. Main Lug Only Panels: UL listed for type and temperature rating of wire specified.
C. Minimum integrated short circuit rating for 240 volt panelboards: 10,000 amperes rms symmetrical at 240 volt. Equivalent to Square D NQOD.
D. Minimum integrated short circuit rating for 480 volt panelboards: 14,000 amperes rms symmetrical at 480 volt. Equivalent to Square D NF.

E. Interiors: Field convertible for top or bottom incoming feed. Main and sub-feed circuit breakers shall be vertically mounted, separate from branch circuit breakers. Interior leveling provisions for flush mounted applications. Interior trim shall be dead-front construction.
F. Panel Circuit Capacity: 18, 30, 42, 72 or 84 as indicated on the panel schedule. 72 and 84 circuit single enclosure panelboards are not allowed on the project.
G. Indoor Enclosure: NEMA PB 1, Type 1. Minimum cabinet box dimensions: 5 3/4 inches deep; 20 inches wide.
H. Cabinet Front: Flush or surface type, hinged one-piece with door, fastened with concealed hardware and trim clamps. Provide concealed hinged door with flush lock. Finish in manufacturer's standard gray enamel.
I. Nameplates:
   1. Manufacturer’s nameplate, located on panel interior front, shall contain system information (such as but not limited to voltage and current ratings) and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and Short Circuit Current Rating including series rating. When Series rating method is acceptable as indicated on the One Line diagram, Series rating information shall be:
      a. Size and type of upstream device.
      b. Branch devices that can be used.
      c. UL series short-circuit rating.
   2. Refer to specification section 26 05 53 for additional nameplate requirements.
J. Panels feeding existing circuits.
   1. Provide multi pole circuit breakers or handle ties for new circuit breakers that feed existing multi wire branch circuits that share a common neutral.

## 2.4 OPTIONS AND ACCESSORIES

A. The accessories below apply to each panelboard or load center shown on the drawings.
   1. OPTION 1:
      a. 200% Neutral Bus: 200% rated solid neutral. Bus shall be the same material as the main bus of the panelboard. Panelboard shall be marked for non-linear load.
   2. OPTION 2:
      a. Isolated Ground Bus: Isolated and insulated from the panelboard enclosure. Bus shall be the same material as the main bus of the panelboard.
   3. OPTION 3:
      a. Dual Main Lugs: Fully rated for ampere rating of the panelboard, conductor range centered on panelboard ampere rating.
   4. OPTION 4:
      a. Feed Through Lugs: Fully rated for ampere rating of the panelboard, conductor range centered on panelboard ampere rating.
   5. OPTION 5:
      a. Compression Lugs: Tool and die applied compression lugs.

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Inspect and report concealed damage to carrier.
B. Handle carefully to avoid damage to panelboard internal components, enclosure and finish.
C. Store in a clean, dry location. Maintain factory packaging and, as required, provide additional heavy canvas or heavy plastic cover to protect panelboards from dirt, water

construction debris and traffic.

## 3.2 EXAMINATION AND PREPARATION

A. Verify equipment dimension match approved submittals.
B. Examine areas to receive panelboards to assure adequate working clearance for panelboard installation.

## 3.3 INSTALLATION

A. Install equipment in accordance with NEMA PB 1.1 and in accordance with NECA Standard of Installation and manufacturer's written requirements.
B. Install equipment plumb. Install recessed equipment flush with wall finishes. Provide supports in accordance with Section 26 05 29.
C. Provide filler plates for unused spaces in equipment.
D. Panelboards
   1. Provide typed circuit directory for each panelboard. The use of adhesive applied directories is not acceptable. The directory shall accurately indicate the types of devices served and the rooms in which the devices are located. The rooms and panelboards shall be designated by the actual name or number designated by the Owner. Revise directory to reflect circuiting changes required to balance phase loads.
   2. Provide engraved plastic nameplates under the provisions of Section 26 05 53.
   3. Provide engraved plastic nameplates under the provisions of Section 26 05 53.

## 3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 26 08 11.

## 3.5 ADJUSTMENT AND CLEANING

A. Adjust doors and operating mechanisms for free mechanical movement.
B. Tighten lugs and bus connections.
C. Clean interior of panelboard.
D. Sand, prime and paint scratched or marred surfaces to match original finish.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.7 DEMONSTRATION AND TRAINING

A. Demonstrate installation and removal of circuit breaker/fused switch and associated mounting hardware.

END OF SECTION

# SECTION 26 27 26 - WIRING DEVICES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Wall switches.
B. Wall dimmers.
C. Receptacles.
D. Wall plates.

### 1.2 SYSTEM DESCRIPTION

A. Provide the wiring devices as indicated on the drawings and specified herein.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.
   1. ANSI – American National Standards Institute.
   2. IEEE – Institute of Electrical and Electronic Engineers.
   3. NECA – National Electrical Contractors Association.
   4. NEMA – National Electrical Manufacturers Association.
   5. NFPA – National Fire Protection Association as adopted by State and/or local codes.
   6. UL – Underwriter's Laboratories.
   7. Other Nationally Recognized Industry Standards.

### 1.4 SUBMITTALS

A. For Approval
   1. Product Data: Provide manufacturer's catalog information showing catalog numbers, ratings, dimensions, colors, and configurations.
B. For Record Purposes
   1. As-built/Record Drawings shall accurately indicate the location of all floor boxes and poke-through fittings.
C. Operations and Maintenance Manuals
   1. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of Product.
   2. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies.

### 1.5 EQUIPMENT DIMENSIONS

A. Notify Engineer of any devices combinations that will not fit into be in a single box as indicated on the drawings.

### 1.6 EXTRA MATERIALS

A. Spare Materials
   1. Furnish two of each style, size and color of wall plate.
B. Maintenance Materials

1. None required.

## 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

# PART 2 PRODUCTS

## 2.1 WIRING DEVICES - GENERAL

A. Use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired only.
B. Acceptable Manufacturers:
   1. Hubbell Wiring Devices.
   2. Cooper Wiring Devices.
   3. Pass and Seymour/Legrand.
   4. Leviton
C. Provide wiring devices of one manufacturer.
D. Verify device finish at time of submittal.
   1. Devices wired to/controlling normal source circuit shall be “White” in color.
      a. Submittals shall identify every device where alternate method is applied for review with architect, engineer and owner.
E. Modularly Connected (Modular) Devices
   1. Modularly connected devices are allowed, but are not required.
   2. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
      a. Connectors shall comply with UL 2459
      b. Polarized connector with minimum six-inch stranded copper wire leads.
      c. Connectors shall have Polycarbonate right-angle housing with finger-safe connector housing which provides insulation from conductive surfaces.
      d. Connectors acceptable Manufactures and style:
         1). Hubbell SNAPConnect
         2). Leviton LevLok
         3). Pass & Seymour PlugTail
         4). Or an approved equal
      e. Devices shall comply with requirements listed in this Section.

## 2.2 SWITCHES

A. Specification Grade:
   1. General Use Toggle Switches (20 amp type):
      a. Single Pole - Hubbell #1221 series.
      b. Double Pole - Hubbell #1222 series.
      c. Three Way - Hubbell #1223 series.
      d. Four Way - Hubbell #1224 series.
      e. Keylock switches - Add an “L” to catalog numbers above.
      f. Provide key type switches where indicated on the drawings.
      g. Provide toggle switches with a "red" light lexan handle for switches utilized for controlling remote equipment. (See drawings for locations.) Provide engraved nameplate identifying the load controlled.
   2. Momentary Contact Switches:
      a. 15 amp type - Hubbell #1556.
      b. 20 amp type - Hubbell #1557.
      c. Provide key type switches where indicated on the drawings.
   3. General Use Style Line (Decora) Rocker Switches (20 amp type):
      a. Single Pole - Hubbell #2121 series.

b. Double Pole - Hubbell #2122 series.
c. Three Way - Hubbell #2123 series.
d. Four Way - Hubbell #2124 series.
e. Pilot Light Rocker Single Pole - Hubbell #2121L series.
f. Provide toggle switches with a "red" light lexan handle for switches utilized for controlling remote equipment. (See drawings for locations.) Provide engraved nameplate identifying the load controlled.

4. Momentary Contact Switches:
   a. 15 amp type - Hubbell #1556.
   b. 20 amp type - Hubbell #1557.

B. Digital Low Voltage Switches
   1. Specification grade lighting control systems as defined in Sections 26 09 25, 26 09 29 and/or 26 09 45.

## 2.3 RECEPTACLES

A. General:
   1. All receptacles shall be grounding type.
   2. All exterior receptacles shall be weather resistant GFCI type.
   3. All wet location receptacles shall be weather resistant GFCI type.
   4. The use of feed-through GFCI receptacles is not allowed.
   5. Special purpose receptacles shall be either specification grade or hospital grade and shall have the characteristics as shown on the drawings.
   6. 120 volt, 15 amp, duplex receptacles may only be utilized on 20 amp circuits where 3 or more receptacles are being served by one 20 amp circuit.

B. Receptacles – Specification Grade:
   1. Standard receptacles. Equals to the listed specification grade receptacles must contain a one piece, all brass, mounting strap with integral ground contacts.
      a. 15 amp, 120V, NEMA 5-15R, duplex - Hubbell #5262 series.
      b. 20 amp, 120V, NEMA 5-20R, single - Hubbell #5361 series.
      c. 20 amp, 120V, NEMA 5-20R, duplex - Hubbell #5362 series.
      d. 15 amp, 120V, NEMA 5-15R, duplex, ground fault interrupter - Hubbell #GFR5252 series.
      e. 20 amp, 120V, NEMA 5-20R, duplex, ground fault interrupter - Hubbell #GFR5352 series.
      f. 15 amp, 120V, NEMA 5-15R, duplex, isolated ground - Hubbell #CR5252IG series.
      g. 20 amp, 120V, NEMA 5-20R, duplex, isolated ground - Hubbell #CR5352IG series.
      h. 15 amp, 120V, NEMA 5-15R, duplex, hospital grade tamper resistant - Hubbell #HBL8200SG series.
      i. 20 amp, 120V, NEMA 5-20R, duplex, hospital grade tamper resistant - Hubbell #HBL8300SG series
      j. 15 amp, 120V, NEMA 5-15R, duplex, surge suppression - Hubbell #HBL5260S series.
      k. 20 amp, 120V, NEMA 5-20R, duplex, surge suppression - Hubbell #HBL5360S series.
      l. 15 amp, 120V, NEMA 5-15R, duplex, tamper resistant, with duplex USB charger - Hubbell #USB15X2 series.
      m. 20 amp, 120V, NEMA 5-20R, duplex, tamper resistant, with duplex USB charger - Hubbell #USB20X2 series.

## 2.4 WALL DIMMERS

A. General

1. Provide wall box dimmers at locations indicated on the drawings. Part numbers provided indicate base specification of series. Equal wall box dimmers manufactured by Leviton, Cooper/Eaton, Legrand, Lutron, etc. are acceptable.
2. Compatible with the voltage of the lighting circuit being controlled: 120V or 277V
3. Provide with linear full-rage slide control.
4. Derating is not required in multi-gang applications.
5. Color to match receptacle and/or switches.

B. LED
1. LED Wall Box Dimmers.
a. 0-10V – Leviton #IP710-DOZ, single pole or three way, 10 amp max load, compatible with LED driver in associated luminaire. Three way operation with standard three way switch.

C. LED Retrofit Lamps/LED Magnetic Low Voltage/LED Electronic Low Voltage
1. Provide dimmer compatible with LED lamp or module.
a. Trim Potentiometer to adjust low-end dimming.
b. Capable of consistent dimming with low end not greater than 20 percent of full brightness.
c. Leviton #IP710 series, single pole or three way, 150W max load for LED or compact flouroscent. Three way operation with standard three way switch.

D.

## 2.5 WALL PLATES

A. Flush Mounted Device Cover Plates: Stainless steel, type 302/304 except in the following areas:
1.

B. Flush Mounted Device Cover Plates: High impact smooth nylon except in the following areas:
1.
2. Verify device finish at time of submittal.
a. Wallplates shall be “white” in color.

C. Surface Mounted Device Cover Plates: 1/2 inch raised galvanized steel covers with a minimum of two screws mounting the wiring device to the coverplate.

D. Weatherproof Cover Plate:
1. New Construction:
a. Vertical Mount: Gasketed, molded high impact, UV stabilized polycarbonate resin with hinged gasketed device cover, TayMac Corp. #72204. Assembly shall be rainproof while in use. Color as selected by Architect from manufacturer’s standard colors.
2. Existing construction or where outlet box can not be recessed in wall:
a. Vertical Mount: Gasketed, flame retardant, UV stabilized, non conductive polycarbonate with hinged gasketed device cover, TayMac Corp. #20350. Assembly shall be rainproof while in use. Color as selected by Architect from manufacturer’s standard colors.
b. Horizontal Mount: Gasketed, flame retardant, UV stabilized, non conductive polycarbonate with hinged gasketed device cover, TayMac Corp. #60350. Assembly shall be rainproof while in use. Color as selected by Architect from manufacturer’s standard colors.

E. All wall plates covering receptacle circuits shall have the plate marked, in a neat, concise manner, with the panel and circuit number. Utilize a permanent marking system. Handwritten identification will not be accepted.

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Inspect and report concealed damage to carrier.
B. Handle carefully to avoid damage to devices, enclosure and finish.
C. Store in a clean, dry location. Maintain factory packaging and, as required, provide additional heavy canvas or heavy plastic cover to protect devices from dirt, water construction debris and traffic.

## 3.2 EXAMINATION AND PREPARATION

A. Verify existing conditions prior to beginning work.
B. Verify that outlet boxes are installed at proper height.
C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
D. Verify that floor boxes are adjusted properly.
E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
F. Verify that all outlet boxes for GFI receptacles are located in an accessible location after intended equipment is installed.
G. Provide extension rings to bring outlet boxes flush with finished surface.
H. Clean debris from outlet boxes.

## 3.3 INSTALLATION

A. General:
1. Install in accordance with NECA "Standard of Installation" and per manufacturer's written instructions.
2. Install devices plumb and level.
3. Install switches with OFF position down.
4.
5. Do not use terminals on wiring devices (hot, neutral or ground) for feed-through connections, looped or otherwise. Make circuit connections via wire connectors and pigtails. All conductors utilized for pigtail connections shall be solid conductors. Do not terminate stranded conductors to any wiring device.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. Connect wiring devices by manu'acturer's written instructions.
8. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
9. Use jumbo size plates for outlets installed in masonry walls.
10. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
11. Install gasket plates for devices or system components having light emitting features, such as switches with pilot lights. Where installed on rough textured surfaces, seal plates with black self-adhesive poly-foam.

B. Switches/Dimmers
1. All toggle switches controlling lighting, equipment and etc. served from an isolated power system shall be 2-pole devices.
2. Wall box dimmers shall be ganged where possible in accordance with the manufacturer's derating factors.
3. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer or as outlined within this specification, whichever is more stringent.
4. 0-10V dimming control wiring for wall box dimmers can be installed in the same conduit as the power wiring if the control wiring is 600V rated.

C. Receptacles
1. Install vertically mounted receptacles with grounding pole on top, horizontally mounted receptacles with grounding pole on left.
2. Ground receptacles with an insulated green grounding conductor from the device ground screw to a pigtail connection. The pigtail connection shall also be

electrically connected to the grounding conductor attached to the metallic box and the grounding conductor from the serving panel if provided.

## 3.4 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.
B. Operate each wall switch with circuit energized and verify proper operation.
C. Verify that each receptacle device is energized.
D. For testing of wiring of receptacles refer to specification section 26 08 11.

## 3.5 ADJUSTMENT AND CLEANING

A. Adjust devices and wall plates to be flush and level.
B. Clean exposed surfaces to remove splatters and restore finish.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.7 DEMONSTRATION AND TRAINING

A. Demonstrate installation and removal of poke-through fittings.

END OF SECTION

# SECTION 26 27 28 - LOW VOLTAGE DISCONNECT SWITCHES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Disconnect switches.
B. Enclosures.

### 1.2 SYSTEM DESCRIPTION

A. Provide the disconnect switches as indicated on the drawings and specified herein.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For Approval
   1. Product Data: Provide outline dimensions of enclosures and accessories, electrical ratings and fuse sizes.
B. For Record Purposes
   1. As-built/Record Drawings shall accurately indicate the location of the equipment and the equipment shall be identified with the final designation as directed by the Owner.
   2. Record all fuse sizes.
C. Operations and Maintenance Manuals
   1. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

### 1.5 EQUIPMENT DIMENSIONS

A. Refer to floor plan drawings for approximate overall dimensions for the equipment of this section. Minor dimensional increases of 6 inches or less are acceptable, unless specific dimensions are indicated for the equipment. Notify the engineer in writing 5 days prior to submitting bid if the dimensional increases will be greater than 6 inches in any dimension.

### 1.6 EXTRA MATERIALS

A. Spare Materials
   1. Provide three fuses of each size, type and rating.
B. Maintenance Materials
   1. None required.

### 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## PART 2 PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Square D.
B. ABB.
C. Siemens.
D. Eaton.

### 2.2 DISCONNECT SWITCH TYPES - HEAVY DUTY

A. TYPE DS:
   1. Non fused Disconnect Switch:
      a. NEMA KS 1; Type HD; 240 or 600 volt rated, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
      b. Equipment ground bar and/or neutral bar as required for the installation.
B. TYPE FS:
   1. Fused Disconnect Switch:
      a. NEMA KS 1; Type HD; 240 or 600 volt rated, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses. Interrupting rating of 100,000 RMS symmetrical amps at 600 Volts.
      b. Equipment ground bar and/or neutral bar as required for the installation.
      c. Blown fuse indicator.
      d. Refer to specification section 26 28 14 for fuses.
      e. Factory provided fuse puller.

### 2.3 ENCLOSURES

A. Enclosure:
   1. Indoor: NEMA KS 1; Type 1; code gauge steel with rust inhibiting primer.
   2. Outdoor: NEMA KS 1; Type 3R; code gauge zinc coated steel with baked enamel finish or Type 4 when indicated on the drawings.
   3. Corrosive Areas: NEMA KS 1; Type 4X; 304 stainless steel with brushed finish.
   4. Hazardous Areas: NEMA KS 1; Type 7/9; copper free, aluminum alloy.
B. Fabricate enclosure including padlocking provisions for the OFF position.
C. Finish using manufacturer's standard enamel finish, gray color.

## PART 3 EXECUTION

### 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Inspect and report concealed damage to carrier.
B. Handle carefully to avoid damage to disconnect switch internal components, enclosure and finish.
C. Store in a clean, dry location. Maintain factory packaging and, as required, provide additional heavy canvas or heavy plastic cover to protect disconnect switches from dirt, water construction debris and traffic.

### 3.2 EXAMINATION AND PREPARATION

A. Verify equipment dimension match approved submittals.
B. Examine areas to receive disconnect switches to assure adequate working clearance for disconnect switches installation.

## 3.3 INSTALLATION

A. Install disconnect switches where indicated, in accordance with manufacturer's instructions.
B. Install disconnect switches plumb. Provide supports in accordance with Section 26 05 29. Do not directly attach disconnect switches to equipment subject to vibration.
C. Install fuses in fusible disconnect switches.
D. Provide engraved plastic nameplates under the provisions of Section 26 05 53.

## 3.4 FIELD QUALITY CONTROL

A. Verify all switches operate freely.
B. Verify installed fuses are properly sized for the served equipment.

## 3.5 ADJUSTMENT AND CLEANING

A. Adjust doors and operating mechanisms for free mechanical movement.
B. Verify fuse size will provide proper operation and compliance with NEC.
C. Tighten lugs and bus connections.
D. Clean interior of disconnect switches.
E. Sand, prime and paint scratched or marred surfaces to match original finish.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.7 DEMONSTRATION AND TRAINING

A. None required.

END OF SECTION

# SECTION 26 50 00 - INTERIOR LUMINAIRES

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Interior Luminaires and accessories
B. Emergency lighting units
C. Exit signs
D. Miniature Lighting Inverters
E. Luminaire accessories

### 1.2 SYSTEM DESCRIPTION

A. Provide the luminaries and accessories as indicated on the drawings and specified herein.

### 1.3 REFERENCES

A. Refer to section 26 05 00 for applicable codes and standards for the material and installation related to this section.

### 1.4 SUBMITTALS

A. For Approval
1. All contractors are required to provide, with their bid, unit pricing for all lighting products.
2. Within twenty-one (21) days of contract award, successful Contractor shall submit a complete list of lighting products he intends on furnishing with manufacturer and complete catalog designations, along with currently quoted lead times for delivery of same. Should the Contractor anticipate that the delivery schedule of any specified product may adversely impact the construction schedule, he shall bring it to the attention of the Owner at this time.
3. Submit fixture shop drawings in booklet form with index and a separate sheet for each fixture, assembled in Luminaire "type" alphabetical order, with specified fixture and accessories clearly indicated on each sheet. The manufacturer and catalog number of any associated driver shall be indicated on fixture cut sheet. Each and every option and accessory which is scheduled for the fixture shall be clearly indicated on each sheet. Provide original cut sheet for each type of driver utilized on the project. The sheets submitted shall be original cut sheets from the manufacturer’s catalog, not photocopies. Indicate dimensions and description of each Luminaire construction.
4. For all luminaires with paint color or finish options, standard or custom, include a single color original of manufacturer’s color or finish choices for architect’s review
5. Shop drawings shall be submitted for review by the Engineer only after they have been reviewed and stamped by the Contractor.
6. Product Data - Fixtures: Provide dimensions, ratings, and performance data.
7. Product Data - Drivers: Provide ratings and performance data for each type of driver on project. If the lighting manufacturer cannot indicate the specific driver being provided in the fixtures, it will be acceptable to provide the generic performance criteria of the driver along with a list of possible driver manufacturers that the fixture manufacturer may use to meet this criteria.
8. Product Data-Luminaire Driver Disconnects: Provide data showing disconnect devices and location in/on fixture. Provide fixture wiring diagram showing actual location(s) of the luminaire driver disconnects.

9. Substitutions/Alternates: Should the Contractor wish to have considered products other than those specified they must submit complete information on the proposed items fourteen (14) days in advance of the bid. Failure to submit prior to the deadline constitutes a guarantee that the specified products will be supplied.

B. For Record Purposes
   1. Update record drawings actual fixture type installed.

C. Operations and Maintenance Manuals
   1. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
   2. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
   3. Maintenance Data: Include replacement parts list.

## 1.5 EQUIPMENT DIMENSIONS

A. Refer to luminaire schedule on drawings for approximate overall dimensions. Also refer to manufacturer’s website of specified luminaire for dimensions of luminaire. Minor dimensional increases of 1 inch or less are acceptable, unless specific exact dimensions are indicated on the drawings. Notify the engineer in writing 5 days prior to submitting bid if the dimensional increases will be greater than 1 inch in any dimension.

## 1.6 EXTRA MATERIALS

A. Provide two (2) of each driver type.
B. Provide two (1) of each exit sign type listed in lighting fixture schedule.

## 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.

## 1.8 REVISIONS

A. Should the Contractor revise, substitute or provide alternate products than those upon which the State of Wisconsin Safety and Professional Services SPS363 Code submittal is based, the Contractor shall pay all costs associated with the revisions and re-submittal of the Lighting Compliance Worksheets to the state. This includes but is not limited to the time required by the Engineer and Lighting Designer to revise documents and re-submit them. It also includes all plan review fees. The Contractor must also provide all documentation necessary for the Engineer to update the submittal.

# PART 2PRODUCTS

## 2.1 LUMINAIRES – GENERAL

A. Provide lighting fixtures of the size, type and rating indicated in "Lighting Fixture Schedule," complete with, but not necessarily limited to, lamps, lampholders, reflectors, drivers, starters, wiring, accessories and any other details required for a complete working installation.
B. Fixture catalog numbers do not necessarily include all accessories and are intended to serve as a guide in defining types and manufacturers of unit only.
C. Type of fixtures to be provided for each outlet is indicated by an alphanumeric designator on drawing.
D. Gasketing material shall be vinyl, neoprene or other non-aging type material as approved by Engineer and is appropriate for the atmosphere in which the fixture is scheduled to be installed.
E. EC shall field verify the ceiling type and coordinate with fixtures.

F. Provide proper trim for each fixture as required for various types of ceilings being installed throughout project; plaster rings, fixture ends or caps, suspension units, mounting brackets, and/or other auxiliary parts necessary to make a complete fixture. It is the Contractor's responsibility to notify the Engineer in writing within 21 days after the bid date of any discrepancies between the electrical drawings, light fixture schedule, architectural plans, reflected ceiling plans and/or room finish schedules. Failure to notify the Engineer of discrepancies means that the Contractor is responsible for any costs associated with changing fixtures to match construction conditions.

G. Housings:
   1. Shall be free from burrs, sharp corners and edges.
   2. Shall be steel, unless noted otherwise, formed and supported to prevent warping and sagging.
   3. Provide with spring loaded latches for all troffers.
   4. Housings shall be post-painted.

H. Mounting Accessories:
   1. Recessed fixtures:
      a. Provide trim type and accessories required for installation in ceiling types specified and/or shown on the reflected ceiling plan and room finish schedule.
      b. Fixtures mounted in sloped ceilings shall be provided with sloped ceiling adapters and appropriate trim rings and other accessories as required.
   2. Surface mounted fixtures:
      a. Provide ceiling spacers as required for fixtures not labeled as suitable for direct mounting to a low-density ceiling.
   3. Suspended fixtures:
      a. Provide swivel canopy to accommodate any sloped ceilings as shown on plans.
      b. Provide pendant or cable length required to suspend luminaires at indicated height.
      c. Swivel hangers in mechanical equipment areas shall be shock-absorbing types.

I. Finishes:
   1. Painted finishes:
      a. Shall be polyester powder painted enamel finish.
      b. Shall be painted after fabrication, unless noted otherwise.
   2. Polished, brushed, other metal finishes:
      a. Shall be finished with clear coat to inhibit finish deterioration and corrosion.
   3. All finish types and colors shall be verified with the architect prior to ordering.

J. Louvers, Reflectors, Lenses:
   1. All louvers and reflectors shall be semi-specular, low iridescent, clear alzak, unless noted otherwise.
   2. Parabolic louver depth shall have a minimum actual dimension of 3" unless specified to be deeper.
   3. All acrylic lenses shall be 100% virgin acrylic material with pattern 12 prismatic, overall 0.125" minimum thickness.

K. Options and Accessories:
   1. Refer to specific list on the Light Fixture Schedule. Coordinate all accessories such as air supply, air return, air handling etc. with the other trades.

## 2.2 TRACK LIGHTING

A. Track:
   1. Track specified with multiple "hot" conductors shall be provided with one neutral conductor for each "hot" conductor.
   2. Support suspended track on maximum 8-foot centers.
   3. Where multi-circuit track is specified provided a separate neutral for each circuit.
   4. Track shall be rated for 20A.

B. Track Heads:

1. Shall securely latch into track, providing positive contact with track conductors.
2. Electronic transformers provided as a track head accessory or integral to a track head shall be provided with a one-year warranty.

C. Track Housing:
1. Where track housing is recessed or semi-recessed into ceiling or wall construction, provide accessories necessary to match actual wall/ceiling construction and finishes. This includes flanged and flangeless trims and slot ceiling covers.

## 2.3 LED LIGHTING

A. The manufacturer offering this item must have produced at least 1000 (one thousand) identical or similar models to that being tendered.
B. The manufacturer of the LED lighting fixture shall utilize high-brightness LEDs.
C. Light output of the luminaire shall be the absolute photometry following IESNA LM-79 requirements and guidelines.
D. Lumen maintenance of the LED's (sources, arrays, modules) shall be reported following IESNA LM-80 requirements and guidelines.
E. Luminaire Color Rendering Index (CRI) shall be a minimum of 70 for exterior fixtures, and a minimum of 80 for interior fixtures.
F. Refer to the luminaire schedule for basis of specification for individual luminaires. Basis of specifications list performance requirements for the specific application of each product. Equal products submitted shall perform within the following tolerances unless otherwise noted.
1. Luminaire Correlated Color Temperature (CCT) shall be as scheduled within a maximum tolerance of +/-200 degrees. For interior fixtures CCT shall be within a 2-step McAdams ellipse.
2. Delivered lumens: +/- 5%
3. Energy consumption: +5%
4. Beam Spread: +/- 4 degrees

G. The LED fixture shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the fixture is to be installed: 25 degrees C for exterior locations and conditioned interior locations, and 40 degrees C for unconditioned interior locations.
H. The luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours at 25 degrees C for exterior locations and conditioned interior locations, and 40 degrees C for unconditioned interior locations.
I. The luminaires shall have a verifiable one hundred (100) hour burn in time at the factory.
J. The luminaire shall be mercury-free, lead-free and RoHS compliant.
K. The luminaire shall be certified by a Nationally Recognized Testing Laboratory (UL, ETL, IEC) as listed by OSHA.
L. LED driver shall have a minimum power factor of 0.9.
M. Unless otherwise noted, electrical components of the LED lighting fixture [Manufacturer's UL listed LED light engine/board array and driver(s)] shall be of modular construction so that each component is individually replaceable in the field for maintenance and repair purposes. Provide internal disconnecting means for each component. The disconnecting means shall be factory installed and shall be Ideal Power Plug or equivalent. Disconnect shall be rated to meet or exceed voltage and ampacity ratings of fixture, see lighting fixture schedule for details.
N. The LED lighting fixture shall carry a limited 5-year warranty minimum for entire LED luminaire including light engine(s)/board array, and driver(s).
O. LED driver shall be compatible with dimming control as specified. Refer to Lighting Fixture Schedule and controls specification.
P. LED driver shall have no pre-programmed default dimming levels specific to the driver electronics. All dimming tolerances shall be field programmable via digital lighting system specified upon Owner request. Dimming tolerances include low and high end trim.

Q. LED driver may be factory-tuned to achieve specified lumen output as directed by lighting designer or engineer at time of submittals. This shall have no affect on dimming range.
R. LED luminaire, driver, and controls shall be submitted for review at the same time to ensure compatibility.
S. When a logarithmic dimming curve is available compared to a linear dimming curve, specific driver cutsheet shall be provided for review of compatibility with control system.
T. All LED fixtures when submitted for review shall include the “Lighting Facts” sheet.

## 2.4 EXIT SIGNS

A. Shall have 6” high with ¾” wide stroke lettering meeting all codes and standards.
B. Provide directional arrows as indicated or required.
C. Provide mounting accessories as required to back, end, pendant, top or flush mount per project requirements.
D. Shall be of modular design, facilitating the replacement of individual parts.
E. Shall be illuminated by LED’s, unless noted otherwise.
F. Shall have a die-cast aluminum housing unless noted otherwise.
G. When indicated on the drawing, provide a pre-wired maintenance-free nicad battery backup with a 90-minute run time unless noted otherwise.
H. Exit signs with internal battery backup shall have self-diagnostic system.
I. Exit signs in areas subject to physical abuse shall be provided with necessary physical protection.
J. Provide all edge-lit exit signs with opaque backing.
K. Exit light housings shall be designed, manufactured and rated for the atmosphere in which they are installed. Provide housings for damp, wet, corrosive or hazardous locations as required by the project.

## 2.5 BATTERY BACKED-UP EMERGENCY LIGHT UNITS

A. Shall have two lamp heads, minimum 7 watts per lamp.
B. Provide internal, pre-wired lead-acid battery, unless noted otherwise.
C. Provide with self-diagnostic system.
D. Emergency battery fixtures in areas subject to physical abuse shall be provided with necessary physical protection.
E. Provide with maintenance-free nicad battery with a 90-minute run time unless noted otherwise.
F. As noted on plans or schedules, each fixture shall be provided with a time delay circuit to keep emergency lighting on for a user-selected amount of time after normal power is restored.

## 2.6 PENDANTS

A. Where pendants are furnished by fixture manufacturer, he shall verify length with the Electrical Contractor, General Contractor and Architect prior to releasing for shipment.
B. Where pendants are furnished by Electrical Contractor, he shall verify length with the General Contractor and Architect prior to installation.
C. Suspended fixtures shall have swivel type alignment hangers in ceiling outlet boxes to ensure plumb suspension.
D. Exit fixtures shall be installed so that line of sight is not obstructed.
E. Stem or cable suspension shall include a canopy cover with color/finish approved by Engineer/Architect.
F. Cable suspension systems shall be adjustable at the luminaire. System shall adjust the suspension length from 0 inches to 6 inches greater than indicated on the drawings.

## 2.7 MINIATURE LIGHTING INVERTERS (MLI)

A. Minature lighting inverters are intended to provide pure sine wave power output inteneded for use in emergency lighting.
B. All batteries and electronics shall be contained in a single cabinet.
C. Output shall be 120V or 277V as dictated by the circuiting on the plans, and shall utilize PWM to provide a pure sine wave output with a crest factor of 4.
D. Output options. The output options for this MLI shall include the following:
    1. Normally On. All fixtures wired to this output shall remain illuminated, whether on normal power or battery power.
    2. Normally Off. All fixtures wired to this output shall remain de-energized while normal power is available, and be illuminated by battery power when normal power is lost.
    3. Switchable. All fixtures wired to this output shall illuminate when a control voltage (120V or 277V) is applied to the MLI and normal power is present. If normal power is lost, all fixtures wired to this output shall be energized from battery power. The control voltage can be applied via local switches, occupancy sensors, timed relays, etc.
    4. Each output shall be capable of accepting the fully rated load of the inverter without derating (e.g. all 500W of lighting load may be routed through the normally on output for a 500W rated miniature lighting inverter.)
E. The batteries shall be lead calcium batteries, and have capacity to provide 90 minutes of power at the full load rating of the inverter.
F. The batteries shall be charged with a charger integral to the unit, and shall be charged via a three rate charing scheme utilizing a bi-directional converter topology.
G. Unit shall be air-cooled utilizing convection methods.
H. Provide unit with wall mounting equipment.
I. The unit shall be UL 924 listed for the switching of emergency lighting loads.
J. Specifications
    1. Total system capacity: 300W or 500W as indicated on the plans.
    2. Input
        a. Voltage – 120 or 277 as indicated on the plans
        b. Frequency – 60Hz, +/- 2Hz
        c. Protection – Input circuit breaker with fast acting fuse in series.
        d. Power Factor – 0.5 lead to 0.5 lag
    3. Output
        a. Voltage – 120 or 277 as indicated on the plans. Output voltage must match input voltage.
        b. Frequency – 60Hz, +/- .02Hz
        c. Overload – 120% for 10 minutes, 400% for 200mS
        d. Transfer Time – Adjustable 50mS (Standard Transfer, for non-HID loads) or 2mS (Fast Transfer, for HID loads)
        e. THD – <3%
        f. Crest Factor – Minimum of 4.
        g. Power Factor – 0.5 lead to 0.5 lag
        h. Protection – Optional circuit breakers, maximum of 3. See plans for cicuit breaker requirements.
    4. Battery
        a. Type – Valve regulated sealed lead calcium
        b. Charger – 3 Rate with temperature compensation
        c. Recharge Time – 24 hour from full discharge to full charge
        d. Protection – Automatic low voltage disconnect (LVD) at 1.67 volts per cell.
        e. Runtime – 90 minutes
    5. Enclosure
        a. Cabinet - Nema type 1, 16AWG, powder coated.
        b. Cooling – Natural Convection with no fans required.
K. Products
    1. Isolite E3-500 Series
    2. Evenlite LiteMinder Series

3. Prior approved equal

## PART 3 EXECUTION

### 3.1 SHIPPING, DELIVERY, STORAGE AND HANDLING

A. Inspect and report concealed damage to carrier.
B. Handle carefully to avoid damage to equipment and finish.
C. Store in a clean, dry location. Maintain factory packaging and, as required, provide additional heavy canvas or heavy plastic cover to protect equipment from dirt, water construction debris and traffic.

### 3.2 EXAMINATION AND PREPARATION

A. Examine substrate and supporting grids for Luminaires and notify Engineer in writing of conditions detrimental to proper and timely completion of work.
B. Do not proceed with work until unsatisfactory conditions have been corrected.
C. Verify ceiling system compatibility with recessed fixture mounting before releasing the order for manufacture.
D. Examine each Luminaire to determine suitability for lamps specified.

### 3.3 INSTALLATION

A. GENERAL
1. Install in accordance with manufacturer's instructions.
2. Contractor shall determine that ceiling suspension system is adequately supported to receive and support the lighting fixtures. Where deemed inadequate, do not install fixtures until additional support has been provided.
3. Verify local codes and ordinances that may pertain to installation and aiming of exterior fixtures. Notify Engineer prior to Bid time if problems are encountered.
4. Make fixture holes for wire entrance with knock-out punches or hole saw, remove burrs. Do not cut holes with tin snips.
5. Special care shall be taken to assure light-tight joints between recessed fixtures and ceiling.
6. Recessed lighting fixtures which are installed in a rough textured ceiling surface where light may be emitted between fixture frame and ceiling surface shall have black self-adhesive polyfoam gasketing installed around inside edges of frame to prevent light leaks.
7. Care shall be taken in placement of outlets and surface-mounted fixtures to maintain alignment, spacings, layout, and general arrangement shown on drawings. Contractor may vary these dimensions slightly in order to clear obstructions. Any major changes in the arrangement must be approved by Engineer.
8. Mount wall and ceiling fixtures independent and secure so that they are not dependent on finish for support and cannot be rotated or displaced.
9. Maintain clearances as required in Article 410 of the NEC. Notify Engineer of any conflict, prior to rough-in.
10. Install suspended Luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend Luminaire at indicated height. Verify heights in the field.
11. Install surface mounted Luminaires plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
12. Install wall mounted Luminaires at height as indicated on Drawings.
13. Install accessories furnished with each Luminaire.
14. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within Luminaire.

15. Bond products and metal accessories to branch circuit equipment grounding conductor.
16. The aiming and adjustment of luminaires must take place after the Project's amenities have been completely installed. These amenities shall include, but not necessarily limited to plantings, furniture, artwork, graphics and signage. Contractor shall include in his base bid, provisions for lifts, scaffolding, extension ladders, and all other materials required to complete adjustments to the satisfaction of the Architect, Engineer and Owner.
17. Install specified lamps in each Luminaire.
18. When Metal Halide lamps are operated on a continuous basis (24 hours/day – 7days/week) the contractor shall inform the owner to turn off the lamps at least once a week for at least 15 minutes.
19. When low-voltage MR lamps are dimmed on a continuous basis the contractor shall inform the owner that the lamps need to be operated at full voltage periodically (full brightness once a week) to keep the halogen regeneration cycle working correctly. This will activate the halogen cleaning cycle.

B. INDOOR
1. Coordinate with trades so lighting fixtures are properly aligned with items such as diffusers, grilles, speakers, sprinkler heads and structure. Coordinate any conflicts with architect and, if necessary, relocate fixtures as directed so there will be no conflict with other equipment or structure.
2. Install tandem fixtures in continuous rows so that finished appearance conforms to appearance of individual units.
3. Align and plumb rows of light fixtures and individual fixtures. Adjust to the satisfaction of the Engineer.
4. Provide additional trim as required for closing openings around recessed fluorescent lights which are mounted in patterns.
5. Support Luminaires larger than 2' x 4' size independent of ceiling framing.
6. Support pendant mounted Luminaires independent of ceiling framing.
7. Locate recessed ceiling Luminaires as indicated on lighting plan. Coordinate all discrepancies between the lighting plan and the reflected ceiling plan and room finish schedule with the architect prior to installation.
8. Exposed Grid Ceilings: Support surface mounted Luminaires on grid ceiling directly from building structure.
9. Install recessed Luminaires to permit removal of all components that may require maintenance from below.
10. Install recessed Luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating or spacing required from insulation in ceiling space.
11. Install clips to secure recessed grid-supported Luminaires in place.
12. Connect recessed Luminaires to branch circuit outlets provided under Section 26 05 34 using flexible conduit only. Allow for positioning of Luminaires in ceiling tile increments.

## 3.4 FIELD QUALITY CONTROL

A. Operate each Luminaire after installation and connection. Inspect for proper connection and operation.

## 3.5 ADJUSTMENT AND CLEANING

A. Aim and adjust Luminaires as directed.
B. Adjust exit sign directional arrows as indicated.
C. Replace Luminaires that have failed at Substantial Completion.
D. Clean electrical parts to remove conductive and deleterious materials.
E. Remove dirt and debris from enclosure.
F. Clean photometric control surfaces as recommended by manufacturer.

G. Clean finishes and touch up damage.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. None required.

## 3.7 DEMONSTRATION AND TRAINING

A. Demonstrate removal and installation of lamps and drivers in all luminaire types.

END OF SECTION

## SECTION 28 13 00 - ACCESS CONTROL SYSTEM

### PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Security control panel.
B. Card readers
C. Miscellaneous devices.

### 1.2 SYSTEM DESCRIPTION

A. Provide a complete card access system as indicated on the drawings and specified herein. The system shall be installed, connected, tested and left in first-class operating condition.
B. The electrical contractor shall provide all raceways and backboxes for the security equipment along with all 120 volt power to the equipment.
C. The proposed system shall be able to utilize Smart Card technology.
D. Electric Strikes, Electronic Locks, magnetic locks, and door position sensors will be provided by the Door Hardware Contractor. This contractor is to install wiring to these devices and connect to system.

### 1.3 REFERENCES

A. NFPA 70 - National Electrical Code.
B. UL - Underwriters Laboratories.

### 1.4 SUBMITTAL

A. For Approval
   1. Shop Drawings:
      a. Complete shop drawings of all custom-fabricated or assembled products.
      b. Bill of materials listing all components and devices.
      c. Product Data: Provide electrical characteristics and typical connection requirements.
B. For Record Purposes
   1. Record actual locations of all field detection devices, signaling devices, field wiring including cable type and raceway wire fill and hidden devices such supervisory relays and end-of-line resistors.
   2. Test Reports: Indicate satisfactory completion of required tests and inspections.
C. Operations and Maintenance Manuals
   1. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products.
   2. Provide operation maintenance manuals with the following:
      a. Nomenclature of all replaceable parts, part numbers, current costs, and name and address of nearest vendor of parts. Where manuals include manufacturer's catalog pages, clearly indicate items included and delete it as not included in this installation.
      b. Copy of guarantees and warranties.
      c. Copy of approved shop drawings with data concerning changes made during construction.

3. Upon approval of rough draft, submit three (3) final copies as to each such unit of equipment.

## 1.5 EQUIPMENT DIMENSIONS

A. Refer to floor plan drawings for approximate overall dimensions for the equipment of this section. Minor dimensional increases of 6 inches or less are acceptable, unless specific dimensions are indicated for the equipment. Notify the engineer in writing 5 days prior to submitting bid if the dimensional increases will be greater than 6 inches in any dimension.

## 1.6 EXTRA MATERIALS

A. Spare Materials
   1. None required.
B. Maintenance Materials
   1. None required.

## 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.
B. All equipment and wiring shall be guaranteed against defects in materials and workmanship for a one year period from the start up and beneficial use of the system. Warranty service for the equipment shall be provided by the system supplier's factory trained representative during normal working hours, Monday through Friday, excluding holidays. Emergency service provided at times other than as stipulated above shall be available from the same source at additional cost to the owner.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

A. KeyScan
B. Avigilon
C. AMAG
D. HID

## 2.2 CARD READERS

A. The readers used for access control shall be available in the following types and technologies:
   1. Proximity readers with or without number pad, suitable for surface or “concealed” mounting behind a wall or glass
   2. Card insertion style Wiegand Effect readers, with or without number pad, suitable for flush or door frame mounting.
   3. Card swipe through style Wiegand Effect readers, with or without number pad, suitable for surface or door frame mounting.
   4. Insertion or swipe magnetic stripe readers, with or without number pad suitable for flush or door frame mounting.
   5. Contact and contactless Smart Card reader, suitable for flush or door frame mounting.
   6. Key pad only reader suitable for flush or surface mounting
B. Readers shall be equipped with visual indication for access granted and door unlocked.

C.

## 2.3 DOOR POSITION SWITCH

A. This device shall be comprised of a mated magnetic switch and cylindrical magnetic contact.
B. The door position switches will be provided and installed into the door frame by others.
C. The security contractor shall install a 2c/18ga cable between this device and the door controller in the nearest serving security closet.

## 2.4 REQUEST TO EXIT SENSORS

A. This device shall be a passive infrared detector designed for request-to-exit applications.
B. The device shall have an adjustable operation delay and positioned above the door being controlled.

# PART 3 EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.
B. Accept Products on site in factory packing. Inspect for damage.
C. Protect equipment from extreme temperature and humidity by storing in a conditioned space.
D. Protect equipment from dust and debris by wrapping unit in dust tight cover and storing away from construction activity.
E. Do not store or install unless temperature is maintained between 32 degrees F (0 degrees C) and 104 degrees F (40 degrees C), at a relative humidity less than 95 percent (non-condensing).
F. Maintain conditions during and after installation of Products.

## 3.2 EXAMINATION AND PREPARATION

A. Verify equipment dimension match approved submittals.
B. Examine areas to receive clocks to assure adequate space for the clock installation.

## 3.3 INSTALLATION

A. Provide all equipment, wiring, conduit and outlet boxes required for the installation of a complete and operating system in accordance with applicable local, state and national codes, the manufacturer's recommendations, these plans and specifications. All wiring shall be in a completely separate conduit system. Color coded wires shall be used throughout. Wiring shall conform to the National Electrical Code Article 725. Wire size as required by the manufacturer.
B. The manufacturer's authorized representative shall provide supervision of final system panel connections, perform a complete functional test of the system and submit a written report to the contractor attesting to the proper operation of the system.

## 3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 40 00.
B. Test in accordance with manufacturer's requirements.
C. Upon satisfactory completion of system tests, the system supplier's representative shall present for the owner's consideration a proposal to provide semi-annual inspection and tests of the system.

## 3.5 ADJUSTMENT AND CLEANING

A. Clean interior of all equipment.
B. Adjust equipment for proper operation.

## 3.6 STARTUP/MANUFACTURER FIELD SERVICES

A. Upon completion of the system's modification and installation, an approved representative of the system manufacturer shall be employed to conduct a thorough test of the system and submit a written report of the findings to the Architect. The test shall include, at the least, verifying the following:
   1. The functional operation of each resettable initiating device (manual stations, detectors, etc.) and circuit.
   2. The functional operation of each and every alarm device and circuit.
   3. The functional operation of each monitored device circuit.
   4. The functional operation of each control circuit.
   5. The supervision function of each Initiating, Indicating, Monitoring, Control and Supply Circuit.
   6. Control station automatic signaling.
   7. All tests shall be completed in the presence of the Owner or Owner's representative.

## 3.7 DEMONSTRATION AND TRAINING

A. Provide systems demonstration by a fully qualified, trained representative of the equipment supplier, minimum of 2 hours.
B. Demonstrate normal and abnormal modes of operation, and required responses to each.

END OF SECTION

## SECTION 28 31 06 - FIRE ALARM SYSTEM - INTELLIGENT

### PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Fire alarm control panel.
B. Manual fire alarm stations.
C. Automatic smoke and heat detectors.
D. Fire alarm signaling appliances.
E. Auxiliary fire alarm equipment.
F. Fire alarm wiring and cable.

### 1.2 SYSTEM DESCRIPTION

A. General Scope of Work:
   1. Provide a new  ire Alarm System.
      a. This system [is/shall be]:
         1). An intelligent addressable system.
         2). coded, continuous sounding
         3). U.L. listed.
         4). An electrically supervised system.
   2. The system shall be fully installed, tested and left in first class operating condition.
   3. See fire alarm system riser details for more information regarding suggested system topology.
   4. See floor plans for more information regarding suggested device locations.
B. The work will include, but not be limited to, the following:
   1. New Fire Alarm Control Panel (FACP).
   2. Alarm Initiating Devices.
      a. Manual Stations.
      b. Temperature Detectors (Fixed and Rate-of-Rise).
      c. Area Smoke Detectors.
      d. Duct Mounted Smoke Detectors.
   3. Alarm Indicating Devices:
      a. Horns
      b. Visual Strobes.
   4. Auxiliary Devices:
      a. Control Modules.
      b. Monitor Modules.
      c. Fault Isolation Modules.
      d. Door Release/Holders.
   5. Annunciator Panels, Remote Transponders, Terminal Cabinets, etc.
   6. All wiring (conduit, outlets, wire, etc.) required to provide power to and interconnect all components listed above.
   7. All wiring (conduit, outlets, wire, etc.) required to provide power to, and interconnect, devices supplied under other divisions, including:
      a. Sprinkler water flow switches.
      b. Sprinkler valve supervisory switches.
      c. Sprinkler pressure switches.
      d. Fan shutdown of air handling units through temperature control panels.
      e. Initiation of elevator recall.
      f. Interface with the Building Automation System (BAS).-

8. The provision of all submittal required by the Architect/Engineer and local authorities, and the obtaining of all approvals there from.
9. All equipment shall be U.L. listed compatible as a product of a single fire alarm system manufacturer.
10. Any devices interfacing with the fire alarm system equipment shall be U.L. recognized compatible.

C. Update the existing building automation system graphics such that the building footprint is represented. Within this footprint shall be all the fire alarm system initiation and alarm initiation auxiliary devices. These graphics shall be similar to the existing building graphics. These graphics may utilize the CAD generated floor plans, if applicable.

D. Related work in other Sections:
1. Sprinkler Valve Supervisory Switches: Division 21.
2. Damper Switches and EP Switches: Division 23.
3. Temperature Control Systems: Division 23.

## 1.3 REFERENCES

A. NFPA 70 - National Electrical Code.
B. NFPA 71 -Installation, Maintenance, and Use of Signaling Systems for Central Station Service.
C. NFPA 72 - National Fire Alarm Code.
D. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
E. NFPA 99 - Health Care Facilities.
F. NFPA 101 - Life Safety Code.
G. ADA - Americans with Disabilities Act.
H. UL UOJZ - Underwriters' Laboratories Standard for Fire Alarm Systems.

## 1.4 SUBMITTAL

A. For Approval to Engineer
1. Shop Drawings:
a. Complete shop drawings of all custom-fabricated or assembled products, including wiring diagrams.
b. Drawings identifying all terminals and illustrating all device wiring connections.
c. Bill of materials listing all components and devices.
d. Product Data: Provide electrical characteristics and typical connection requirements.
e. Plans showing device locations and types
f. Typical riser diagrams.
1). Interconnections between all existing and new panels shall be shown on the riser diagrams.
g. Battery calculations for batteries supporting new and modified circuits.
1). For modified circuits, If existing calculations are not available and acceptable to the AHJ, measurements may be utilized. Measure the power draw under alarm prior to modifications and after modifications to determine alarm load. Fire alarm system “idling” current draw may be used from typical manufacturer’s data for that specific panel type.
h. Voltage drop calculations of new and modified circuits.
1). For modified circuits, if existing calculations are not available and If acceptable to the AHJ, measurements may be utilized. Measure the voltage at end of line prior to modifications and after modifications to demonstrate that voltage drop requirements have been achieved.

B. For Approval by Authority Having Jurisdiction (AHJ)

1. Fire alarm vendor and electrical contractor shall prepare and submit to the AHJ all required equipment product data, wiring diagrams and calculations such as:
   a. All and any information and data (such as drawings showing device locations and types, typical riser diagrams, typical wiring diagrams, approvals, test data, etc.) required by local authorities.
   b. Battery calculations for batteries supporting new and modified circuits.
      1). For modified circuits, If existing calculations are not available and acceptable to the AHJ, measurements may be utilized. Measure the power draw under alarm prior to modifications and after modifications to determine alarm load. Fire alarm system “idling” current draw may be used from typical manufacturer’s data for that specific panel type.
   c. Voltage drop calculations of new and modified circuits.
      1). For modified circuits, if existing calculations are not available and If acceptable to the AHJ, measurements may be utilized. Measure the voltage at end of line prior to modifications and after modifications to demonstrate that voltage drop requirements have been achieved.

C. For Record Purposes
   1. Record actual locations of all field mounted initiating devices, signaling appliances, field wiring including cable type and raceway wire fill and hidden devices such supervisory relays and end-of-line resistors. These drawings shall provide sufficient detail as outlined in NFPA 72. Drawings shall be reproducible.
   2. Test Reports: Indicate satisfactory completion of required tests and inspections.
   3. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products.

D. Operations and Maintenance Manuals
   Provide peration maintenance manuals with the following:
   a. Nomenclature of all replaceable parts, part numbers, current costs, and name and address of nearest vendor of parts. Where manuals include manufacturer's catalog pages, clearly indicate items included and delete it as not included in this installation.
   b. Copy of guarantees and warranties.
   c. Copy of approved shop drawings with data concerning changes made during construction.
   2. Upon approval of rough draft, submit three (3) final copies as to each such unit of equipment.

## 1.5 EQUIPMENT DIMENSIONS

A. Refer to floor plan drawings for approximate overall dimensions for the equipment of this section. Minor dimensional increases of 6 inches or less are acceptable, unless specific dimensions are indicated for the equipment. Notify the engineer in writing 5 days prior to submitting bid if the dimensional increases will be greater than 6 inches in any dimension.

## 1.6 EXTRA MATERIALS

A. Spare Materials
   1. (2 ) Strobe only
   2. (2) Speaker only
   3. (2) combination Speaker/Strobe
   4. (1) smoke detector w/ base
   5. (2) of each monitor and/or control module used on this project
   6. (0) heat detector w/base
   7. (2) manual pull station

B. Maintenance Materials
   1. None required.

## 1.7 WARRANTY

A. Refer to warranty requirements in section 26 05 00.
B. All equipment and wiring shall be guaranteed against defects in materials and workmanship for a one year period from the start up and beneficial use of the system. Warranty service for the equipment shall be provided by the system supplier's factory trained representative during normal working hours, Monday through Friday, excluding holidays. Emergency service provided at times other than as stipulated above shall be available from the same source at additional cost to the owner.

## 1.8 RELATED WORK

A. For related work and/or additional requirements to refer to Division 26 for the following but not limited to:
   1. Common Results for Electrical.
   2. Minor Electrical Demolition for Remodeling.
   3. Electrical Equipment Mounting Requirements.
   4. Building Wire and Cable
   5. Conduit for Electrical Systems.
   6. Boxes for Electrical Systems.

## 1.9 SYSTEM CONFIGURATION

A. The system shall be configured such that system Signaling Line Circuits (SLC) shall not leave large areas of the building unprotected upon cable failure. The following rules must be maintained when wiring this system:
   1. The SLC shall be wired in a Class A Style 6 configuration.
   2. Each circuit serving addressable devices shall have a main "trunk" cable which shall be looped from the FACP so that a break or short in the main trunk line shall not disable any part of the circuit. Taps from this main trunk line shall only be completed utilizing isolation modules. No more than 20 addressable devices shall be installed on a "fault isolated" tap from the main trunk.
   3. The supply and return "trunk lines" shall be routed in different conduits, so as to enhance system protection. A fault isolation module or equivalent device shall be installed where the main trunk cable exits the fire alarm control panel.
   4. Each SLC shall have no more than 65% of the maximum addressable device quantity for either analog input or digital input/output type devices.
   5. No main trunk shall serve more than one (1) floor.
B. The system shall be configured such that system Signaling Line Circuits (SLC) shall not leave large areas of the building unprotected upon cable failure. The following rules must be maintained when wiring this system:
   1. The SLC shall be wired in a Class B Style 4 configuration.
   2. Each SLC shall have no more than 65% of the maximum addressable device quantity for either analog input or digital input/output type devices.
   3. No SLC shall serve more than one (1) floor.
   4. Provide two fault isolator modules per SLC. Divide the number of initiating devices equally on the circuit.
C. The Notification Appliance Circuits (NAC) shall be configured per the following rules:
   1. The NAC shall be wired in a Class B Style Y configuration.
   2. Each NAC shall use no more than 70% of the circuits' power capacity.

3. No NAC shall serve more than one (1) floor.

D. Communication wiring between panels shall be Class A Style 7.

## 1.10 SYSTEM OPERATION

A. Standby Mode:
   1. Under normal condition the front panel shall display a "SYSTEM IS NORMAL" message and the current time and date. When an abnormal condition is detected, the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steadily for trouble and supervisory conditions.

B. Alarm Sequence:
   1. Audible and visual alarm indicating appliances shall operate until silenced by the alarm silence switch at the control panel.
   2. The fire alarm control panel shall provide the power to operate associated elevator shunt trip circuit breakers.
   3. Refer to attached typical sequence of operations for additional information.

C. Acknowledgment of System Activity:
   1. The system shall have an alarm list key that will allow the operator to display all alarms, troubles, and supervisory service conditions with the time of occurrence. This shall allow for the determination of not only the most recent alarm but may also allow tracing the path of the fire.
   2. Pressing the appropriate acknowledge button shall globally acknowledge every point in alarm.
   3. After all points have been acknowledged, the LED's shall glow steady and the panel audible signal shall be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be indicated by the message "END OF LIST".
   4. Provision shall be made for pass code protection of: Acknowledge, Alarm Silence, System Reset, and Manual Control functions. Four (4) access levels shall be provided. Pass codes shall consist of up to ten (10) digits. Changes to pass codes shall only be made by authorized personnel.

D. Alarm Silencing:
   1. Pressing the "Alarm Silence" button shall cause all audible and visual alarm signals to cease operation.
   2. The system shall not permit signals to be silenced during alarm silence inhibit mode.

E. System Reset:
   1. The "System Reset" button shall be used to return the system to its normal state after an alarm condition has been remedied. The LCD display shall step the user through the reset process with simple English language messages.
   2. Should an alarm condition continue to exist, the system shall remain in an abnormal state and system control relays shall not reset. The display shall indicate the total number of alarms and troubles present, along with a prompt to review the points.
   3. When the Alarm Silence Inhibit function is active, the message, "SYSTEM RESET INHIBITED", shall be displayed.

F. Supervisory Service:
   1. Activating the Supervisory Service Acknowledge Switch shall silence the supervisory audible signal but cause the LED to remain on.
   2. Restoring the tamper switch monitored sprinkler system valve to the normal position shall cause the Supervisory Service LED to extinguish and audible signal to pulse indicating restoration to normal position.
   3. Activating the Supervisory Service Acknowledge Switch again shall silence the audible signal and restore the system to normal.
   4. Refer to attached typical sequence of operations for additional information.

G. Provision shall be made for manual test of the evacuation system without operating auxiliary control circuits such as air handlers, door locks and etc.

H. Circuit Supervision:
   1. The system shall provide independently supervised initiation circuits so that a fault in any one zone shall not affect any other zone. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.
   2. The system shall provide supervisory initiation device circuits for connection of all sprinkler valve supervisory switches to perform the Supervisory Service Operation. Supervisory switches shall NOT be connected to the same circuits as flow alarm switches or other fire alarm initiation devices.
   3. The system shall provide independently supervised and independently fused indicating appliance circuits for alarm devices. Disarrangement conditions of any circuit shall not affect the operation of other circuits.
   4. The following additional devices/circuits shall be supervised:
      a. Auxiliary manual control circuits.
      b. Incoming power to the system.
      c. System batteries for low voltage or battery disconnection.
      d. System Expansion Modules.
      e. Auxiliary module LED's

I. Signaling Line Circuits (SLC)
   1. All system operations shall be multiplexed on a multi-addressable peripherals network to interlink fire alarm devices to the control center. The communication format shall be a poll/response protocol to allow T-tapping of the wire to addressable devices and be completely digital. Systems not using full digital transmission protocol (i.e. time pulse width methods) shall not be acceptable.
   2. The system shall provide communication with all initiating and control devices individually. All of these devices shall be individually annunciated at the control panel. Annunciation shall include the following conditions for each point: Alarm, Trouble, Open, Short, Ground, Device Fail/or Incorrect Device.
   3. All addressable devices shall have the capability of being disabled or enabled individually.
   4. Addressable Devices shall be uniquely identified by a DIP switch, or rotary switch, selectable address code entered on each device at time of installation. The use of jumpers to set addresses is not acceptable. Device identification schemes not using uniquely set addresses by relying on electrical position along the communication channel are unacceptable. The system shall provide for the addition of addressable devices between existing devices without reprogramming of the existing devices.
   5. The system shall be capable of operating a minimum of 200 addressable devices per single pair of SLC wires.
   6. The system shall allow up to 2,500 feet wire length to the furthest addressable device. T-tapping of the communications channel shall be supported except where Class A wiring is required.

## 1.11 ZONE CODING LIST

A. Listed below are [added] building fire alarm system zone codes required for this project:
   1. ZONE # DESCRIPTION

B. All existing system zone codes shall remain as presently functioning with the following exceptions:
   1. _____.

## 1.12 SIGNAL LINE CIRCUIT LIST

A. Listed below are added minimum building fire alarm system signal line circuits required for this project:
   1. DESCRIPTION

## 1.13 EVACUATION ZONES

A. This is a defend in place facility.
B. Each fire/smoke zone shall be considered an evacuation zone.
   1. Refer to floor plans for expected smoke/evacuation zones based on information available at the time of design.
   2. Refer to Fire/smoke zones indicated on the Architectural Life Safety plans for additional information.
   3. Final smoke/evacuation zone coordination between installing contractor and architect/owner shall take place prior to commencing with installation.
C. Each evacuation zone shall be provided with its own dedicated speaker and notification appliance circuits.
D. Each evacuation zone shall be provided with its own dedicated door holder circuit(s).

# PART 2PRODUCTS

## 2.1 MANUFACTURERS

A. Simplex.
B. Notifier.
C. EST.
D. JCI
E. Honeywell
F. Siemens
G. Fike

## 2.2 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

A. Panel shall be located where indicated on drawings.
B. Panel shall include with key operated, locked door and shatter-resistant viewing window.
C. Refer to plans for surface or flush mounting requirements.
D. Fire Alarm Control panel shall be modular with solid state, microprocessor based electronics. Controls and visual indicators essential to operation during a fire alarm condition shall be displayed at all times. A keypad for control and maintenance shall be provided.
E. Audible and visual indicators shall be activated during Alarm, Trouble, or Supervisory conditions. The audible device shall produce a different sound for each condition. There shall be an audible acknowledgement of all keypad entries. The visual indications shall be as herein specified.
F. The following controls and visual indicators shall be visible through a front access panel:
   1. backlit liquid crystal display.
   2. Individual red system alarm LED.
   3. Individual amber supervisory service LED.
   4. Individual yellow trouble LED.
   5. Green "power on" LED.
   6. Alarm Acknowledge key.
   7. Supervisory Acknowledge key.
   8. Trouble Acknowledge key.
   9. Alarm Silence key.

10. System Reset key.

G. Controls for: city disconnect, manual evacuation, elevator recall bypass, door holder release bypass.

H. Metal oxide varistors (MOV's) shall be provided on the system power supply and municipal connection circuit to provide transient suppression protection to the control panel.

I. Furnish and install batteries, sealed, rechargeable, lead calcium and capable of providing twenty four, (24) hours of complete fire alarm operation in the event of loss of commercial power. Batteries may be located in the Fire Alarm Control Panel, or in another cabinet adjacent to the main Fire Alarm Control Panel.

J. Batteries shall have low/no battery supervision and shall be kept fully charged by the control panel automatic charger. Charger shall be capable of recharging batteries to 70% capacity in 12 hours. Minimum battery size shall be 10 AH.

K. The following lists shall be available from the point lists menu:
   1. All points list by address.
   2. Monitor point list.
   3. Signal list.
   4. Auxiliary control list.
   5. Feedback point list.
   6. Pseudo point list.
   7. LED/switch status list.

L. Scrolling through menu options or lists shall be aided by prompt messages.

M. Historic Logging:
   1. The control panel shall have the ability to store three hundred (300) events in an alarm log plus three hundred (300) events in a trouble log along with time and date of occurrence. These events shall be stored in a battery protected random access memory.
   2. The Historic Alarm Log events shall consist of: System Reset, Alarm Silence, Alarm Acknowledgement, Alarm Conditions, and Alarm Historic Log Cleared.
   3. The Historic Trouble Log events shall consist of: Trouble Conditions, Supervisory Conditions, Trouble Acknowledgement, Supervisory Acknowledgement, Alarm Verification Tallies, Walk Test Results, and Trouble Historic Log Cleared.

N. Walk Test with Historic Logging:
   1. The system shall be capable of being tested by one person. While in the testing mode, the alarm activation of an initiating device circuit shall be silently logged s 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.

O. Panel shall be equivalent to a (Simplex 4100ES; Notifier NFS2-3030; Honeywell XLS-3000; Siemens XLS; JCI IFC-3030; EST3; Fike CyberCat)

P. Panel shall be BACnet compatible.

Q. Panel shall include capacity for digital voice messaging.

R. [Panel shall accept a minimum of (8) inputs from the building telephone paging system.]

S. Panel shall supervise speaker circuits even during paging or other non-fire alarm events.

T. Panel, Transponder Panels and NAC extenders shall be provided with the ability for future mass notification input and outputs..

## 2.3 REMOTE ANNUNCIATOR

A. Furnish and install, where shown on the drawings, a serial LCD annunciator. The annunciator shall be capable of indicating alarm, trouble or status of any system operation or condition. The annunciator shall communicate with the control panel over one twisted shielded pair of

wires plus operating power which shall be 24 VDC, and be provided by and fused at the control panel. Point-wired annunciators shall not be considered as equal.

B. Unit shall include a back-lit LCD display.

C. Refer to plans for surface or flush mounting requirements.

D. The serial annunciator shall provide a common alarm and trouble circuit consisting of:
   1. Control pushbutton switches for: alarm silence, trouble silence, system reset and manual evacuation duplicating the control panel switches. A key "enable" switch shall be provided to activate or deactivate the control switches.
   2. Tone Alert: duplicated the control panel tone alert during alarm and trouble conditions.
   3. System trouble LED.
   4. Power on LED.
   5. To accommodate and facilitate job site changes the control switches shall have the capability to be programmed on site to provide for required manual switch input operation.

E. Manual Control Switches shall be provided for the following functions:
   1. System Reset.
   2. Alarm Silence.
   3. Trouble Silence.
   4. Manual Evacuation.

## 2.4 PANEL/ANNUNCIATOR DISPLAY INFORMATION

A. Alarm annunciator at the main fire alarm control panels and all annunciators shall be per the following format:

| FIRE ALARM SYSTEM INDICATING DEVICE ALARM SCHEDULE | | | | |
|---|---|---|---|---|
| BUILDING | LEVEL | DEVICE | MAPNET | AREA |
| Building location of the alarm | Building level the alarm originated at. | Type of fire alarm device. | Actual fire alarm system address | Specific description indicating the location of the fire |

## 2.5 REMOTE DEVICES

A. Printer:
   1. Furnish and install, where shown on the drawings, a dot matrix printer. The printer shall receive English language test from the fire alarm control panel in an industry standard ASCII format via an EIA RS-232-C connection.
   2. Printer shall be capable of printing the following:
      a. Log in, Log out.
      b. Alarm and trouble historical logs.
      c. Current alarms, troubles, and supervisory conditions.
      d. Acknowledging of alarms, troubles, and supervisory conditions.
      e. Alarm silencing.
      f. System reset.
   3. Printed information shall include time and date.

B. Color Graphics Display
   1. Furnish and install, where shown on drawings, a desktop computer with 19 inch LCD touchscreen monitor, keyboard, mouse and Graphics Display programming.
   2. The desktop shall include ports for connections to fire alarm control panel and other future network connections.
   3. The desktop shall include dual screen capabilities.

4. The desktop shall meet all minimum requirements set by manufacturer.
5. The operating system shall be the latest version of Windows currently supported by the manufacturer's software.
6. The software shall support:
    a. Custom alarm and system messages
    b. Capacity for 50,000 points or point groups
    c. Capacity for logging 500,000 events with operator notations
        1). This shall be compatible with spreadsheet and database programs.
    d. Multiple password controlled operator levels with selectable feature access
    e. Custom field generated and editable graphic screen capacity
    f. Configurable icon touch size
    g. Captive and Non-Captive operation
    h. Individual point access for control or point property revisions

## 2.6 INITIATING DEVICES

A. Manual Station:
    1. Semi-Flush mounted
    2. Intelligent addressable
    3. Single action manual station
    4. Unit shall have field adjustable addressing
    5. Provide manufacturer's standard back box.
    6. Provide red wireguards where shown on the drawings.
B. Combination Heat Sensor:
    1. Intelligent addressable, analog heat sensor.
    2. Unit shall have field adjustable addressing.
    3. Provide with standard sensor base.
    4. Temperature rating shall be 135° F. unless noted otherwise on plans.
    5. Rate of Rise temperature sensing shall be 15° F. per minute, unless noted otherwise on plans.
C. Fixed Heat Sensor:
    1. Electronic heat sensor.
    2. Temperature rating shall be 200° F. unless noted otherwise on plans.
D. Smoke Sensor:
    1. Intelligent addressable
    2. Photoelectric type
    3. Adjustable sensitivity
    4. Plug in base with integral LED.
    5. Unit shall have field adjustable addressing.
    6. Provide with standard sensor base.
E. Duct Mounted Smoke Sensor:
    1. Intelligent addressable
    2. Photoelectric type
    3. Adjustable sensitivity
    4. Unit shall have field adjustable addressing.
    5. Unit shall include LED on sensor housing.
    6. Duct sampling tubes shall extend the width of duct
    7. Unit shall include visual indication of detector actuation, in duct-mounted housing.
    8. Provide all concealed from view duct mounted smoke detectors with a remote LED indicator/Test switch.
        a. Locate the remote LED/Test device where easily visible by building staff.
        b. Location may be in the ceiling of corridors in finished areas, or on walls of mechanical rooms and maintenance closets, near entrance into room.
        c. Verify exact location desired with building staff.

## 2.7 SIGNALING APPLIANCES

A. Combination Alarm Horn/Strobe:
   1. Semi-flush mounted in wall or ceiling in finished areas.
   2. Sound Rating: 87 dBA at 10 feet.
   3. Tone shall be temporal 3 code.
   4. Provide with integral strobe lamp and flasher
   5. Provide with lettered "FIRE" on the faceplate.
   6. Install in horn strobe in a common backbox.
   7. Horn may share cabling with visual devices.
   8. Flash rate shall be 1 flash per second (1 Hz) complying with the ADA.
   9. Provide with selectable 15, 30, 75 and 110 Candela strobe output.
B. Horn Only:
   1. Semi-flush mounted in wall or ceiling in finished areas as shown on plans.
   2. Sound Rating: 87 dBA at 10 feet.
   3. Tone shall be temporal 3 code.
   4. Provide with lettered "FIRE" on the faceplate.
   5. Horn may share cabling with visual devices.
C. Strobe Only:
   1. Semi-flush mounted in wall or ceiling in finished areas as shown on plans.
   2. Strobe lamp with lettered "FIRE" on the faceplate.
   3. Flash rate shall be 1 flash per second (1Hz) complying with ADA.
   4. Provide with selectable 15, 30, 75 and 110 Candela strobe output.
D. All strobes shall be synchronized
E. [All notification devices shall be intelligent addressable
F. All wall mounted devices shall be [white with red / red with white] lettering.
G. All ceiling mounted devices shall be white with red lettering.
H. Re-Entrant Speaker:
   1. Surface mounted loudspeaker.
   2. Sound rating: 102 dBA at 10 feet on the 15W tap.
   3. Tone shall be temporal 3 code.
   4. Provide in red color.
   5. Speaker shall be equivalent to Wheelock STH-15 series.

## 2.8 AUXILIARY DEVICES

A. Monitor Module:
   1. Intelligent Addressable
   2. Unit shall include integral LED
   3. Unit shall have field adjustable address.
B. Control Module:
   1. Intelligent Addressable
   2. Unit shall include integral LED
   3. Unit shall have field adjustable address.
C. Refer to monitor and control module schedules on the drawings. The intent of these schedules is to list the interface points with non-fire alarm equipment. Provide additional modules as required for internal fire alarm system requirements.
D. Fault Isolator Module:
   1. Intelligent Addressable
   2. Unit shall automatically isolate circuits when output short is detected.
   3. Unit shall allow manual isolation of circuit through control panel selection.
   4. Unit shall include integral LED.

## 2.9 FIRE ALARM WIRE AND CABLE

A. Fire Alarm Power Branch Circuits:
   1. Building wire as specified in Section 26 05 21.
B. Signaling Line and Indicating Appliance Circuits:
   1. Shall comply with NEC, with particular attention to Article 760.
   2. All cables shall be a manufacturer and type tested to be compatible with the Fire Alarm manufacturer selected.
C. Where Signaling Line, Initiating device and Indicating Appliance Circuits serving a particular evacuation zone are run through a separate evacuation zone CIC cable shall be utilized.
   1. CIC cable shall be a current UL listed product equivalent Radix Duralife.
D. All cables connecting fire alarm panels shall be a UL listed 2-Hour rated circuit integrity cable (CIC) or the cable shall be routed within a UL listed 2-hour pathway/enclosure.

# PART 3EXECUTION

## 3.1 SHIPPING, DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.
B. Accept Products on site in factory packing. Inspect for damage.
C. Protect equipment from extreme temperature and humidity by storing in a conditioned space.
D. Protect equipment from dust and debris by wrapping unit in dust tight cover and storing away from construction activity.
E. Do not store or install unless temperature is maintained between 32 degrees F (0-degrees C) and 104 degrees F (40 degrees C), at a relative humidity less than 95 percent (non-condensing).
F. Maintain conditions during and after installation of Products.

## 3.2 EXAMINATION AND PREPARATION

A. Verify equipment dimension match approved submittals.
B. Examine areas to receive equipment to assure adequate space for the equipment installation.

## 3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions. Installation shall be supervised and tested by the manufacturer of the system equipment. The work shall be performed by skilled technicians under the direction of experienced engineers, all of whom shall be properly trained and qualified for this work.
B. Raceway requirements
   1. Install all fire alarm system wiring in conduit.
   2. Where multiple horizontal runs to a single panel are made for a class A circuit (IE: in and out cabling), they shall be separated by a distance of 4 feet or greater until they are within a maximum distance of 10’ from the fire alarm panel.
   3. Where vertical runs to a single panel are made for a class A circuit (IE: in and out cabling), they shall be separated by a distance of 1 foot or greater.
   4. Utilize plenum rated cable, and install fire alarm system wiring through low voltage cabling pathways as specified in section 27 05 28.
   5. 2-Hour Rated Pathway:
      a. Shall be installed in conduit.

b. Conduit and associated fittings utilized as part of a pathway for survivable cable must be listed as part of the UL listed 2-hour survivable cable system.
c. Conduit installation methods shall follow UL requirements specific to the survivable cable system utilized
d. Where routed within a UL listed 2-hour rated enclosure normal conduit installation methods may be utilized.

C. Minimum size conductors for individual devices are as follows:
1. Strobes - 2 #14.
2. Signaling line or initiating device circuit wiring - 2 #18 twisted.
3. Remote annunciator/graphic devices - 2 #18 twisted for data transmission and 2 #12 for power.
4. Fire alarm cabling shall be red.

D. Mount outlet box for electric door holder to withstand 80 pounds (36.4 kg) pulling force.

E. Conductors within equipment enclosures shall be carefully cabled and laced. Individual conductors shall be identified in accord with Section 26 05 29.

F. Outlet pull and junction boxes shall be painted red on the exterior and shall be installed in accord with Section 26 05 34.

G. Label all fire alarm devices, including bases, with circuit number and address.

H. Locate all duct detectors associated with main air handling units (supply and return ducts) in the locations shown on the drawings.

I. All duct detectors in association with fire/smoke dampers shall be located upstream of these dampers.

J. Final smoke detector locations shall be coordinated with HVAC such that a minimum 3 feet of separation is maintained between the smoke detectors and final diffuser/grill locations.

K. EC shall furnish and wire the duct smoke detectors. EC shall turn the duct type smoke detectors over to the Mechanical Contractor for installation.

L. T-tapped connections will not be allowed on any supervised or Class A Style 4 SLC circuits.

M. Connections shall be made directly to and from device terminal screws of fire alarm devices. Screw terminals shall have rising plates to terminate more than one wire or each wire shall be terminated to individual screws or each wire shall terminate in a ring lung.

N. Cabling serving any supervised and SLC circuits shall not be spliced in any boxes. Cabling shall be continuous between field devices, "splice-free".

O. Provide enough slack cable at each ceiling mounted device such that the device may be moved (2) tiles in any direction.

P. The Temperature Control Contractor must be coordinated with during programming of the Fire Alarm control panel for operation and control of control modules interfaced with HVAC equipment.

## 3.4 FIELD QUALITY CONTROL

A. Fully functional test system to verify proper system operation.

B. Test in accordance with NFPA 72 and local fire department requirements.

## 3.5 ADJUSTMENT AND CLEANING

A. Clean interior of all equipment.

B. Adjust taps on all speakers for proper sound level.

## 3.6 START UP/MANUFACTURER FIELD SERVICES

A. Upon completion of the system's modification and installation, an approved representative of the system manufacturer shall be employed to conduct a thorough test of the system and submit a written report of the findings to the Architect. The test shall be per NFPA 72 and shall include, at the least, verifying the following:

1. The functional operation of each resettable initiating device (manual stations, detectors, etc.) and circuit.
2. The functional operation of each and every alarm device and circuit.
3. The functional operation of each monitored device circuit.
4. The functional operation of each control circuit.
5. The supervision functions of each Initiating, Indicating, Monitoring, Control and Supply Circuit.
6. Control station automatic signaling.
7. All tests shall be completed in the presence of the Owner or Owner's representative.

## 3.7 DEMONSTRATION AND TRAINING

A. Provide systems demonstration by a fully qualified, trained representative of the equipment supplier.
B. Provide a total of 8 hours of demonstration and training for the system. Demonstrate normal and abnormal modes of operation, and required responses to each.

## TYPICAL FIRE ALARM SYSTEM SEQUENCE OF OPERATION

| | SYSTEM ANNUNCIATION | | | | ELEVATOR FUNCTIONS | | | | | | DOOR FUNCTIONS | | | | | OR FUNCTIONS | | | HVAC FUNCTIONS | | | MISCELLANEOUS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SYSTEM OPERATION / SYSTEM DEVICE | ALARM | SUPERVISORY | OCCUPANT NOTIFICATION | | ELEVATOR PRIMARY LEVEL RECALL | ELEVATOR SECONDARY LEVEL RECALL | FIRE FIGHTER HAT LIGHTED | ELEVATOR SHUT DOWN | HOISTWAY VENTILATION | | RELEASE SMOKE DOORS | UNLOCK ELECTRICALLY SECURED DOORS | DISABLE AUTO OPERATORS IN RATED/SMOKE | RELEASE ELECTRICALLY LOCKED TOILET ROOM | | INITIATE OPERATING ROOM/C-SECTION SMOKE EVACUATION | INITIATE ENDO ROOM SMOKE EVACUATION | | CLOSE SMOKE DAMPERS | INITIATE AHU SHUT DOWN PROCEDURES | STAIRWELL PRESSURIZATION | NOT REQUIRED FOR PROJECT | | | |
| SMOKE DETECTOR | X | | X | | | | | | | | X | X | X | X | | | | | | | X | | | | |
| SMOKE DETECTOR - ELEVATOR MACHINE ROOM | X | | X | | X | | X | | | | | | | | | | | | | | | | | | |
| SMOKE DETECTOR - ELEVATOR HOISTWAY | | X | | | X | | X | | X | | | | | | | | | | | | | | | | |
| SMOKE DETECTOR - ELEVATOR PRIMARY LEVEL LOBBY | X | | X | | | X | | | X | | X | X | X | X | | | | | | | X | | | | |
| SMOKE DETECTOR - ELEVATOR SECONDARY LEVEL LOBBY | X | | X | | X | | | | X | | X | X | X | X | | | | | | | X | | | | |
| HVAC UNIT DUCT DETECTOR | | X | | | | | | | | | | | | | | | | | | X | | | | | |
| HVAC DAMPER DUCT DETECTOR | | X | | | | | | | | | | | | | | | | | X | | | | | | |
| TYPICAL OR/C-SECTION DUCT DETECTOR | | X | | | | | | | | | | | | | | X | | | | | | | | | |
| TYPICAL ENDO DUCT DETECTOR | | X | | | | | | | | | | | | | | | X | | | | | | | | |
| HEAT DETECTOR | X | | X | | | | | | | | | | | | | | | | | | | | | | |
| HEAT DETECTOR - ELEVATOR MACHINE ROOM | | X | | | | | X | X | | | | | | | | | | | | | | | | | |
| HEAT DETECTOR - ELEVATOR HOISTWAY | | X | | | | | X | X | | | | | | | | | | | | | | | | | |
| TYPICAL PULL STATION | X | | X | | | | | | | | X | X | X | X | | | | | | | | | | | |
| TYPICAL FLOW SWITCH | X | | X | | | | | | | | X | X | X | X | | | | | | | | | | | |
| TYPICAL TAMPER SWITCH | | X | | | | | | | | | | | | | | | | | | | | | | | |
| FOOD SERVICE HOOD - ALARM | X | | X | | | | | | | | | | | | | | | | | | | | | | |
| FOOD SERVICE HOOD - TROUBLE | | X | | | | | | | | | | | | | | | | | | | | | | | |
| FOOD SERVICE HOOD - SUPERVISORY | | X | | | | | | | | | | | | | | | | | | | | | | | |
| PRE-ACTION/CLEAN AGENT SYSTEM - ALARM | X | | X | | | | | | | | | | | | | | | | | | | | | | |
| PRE-ACTION/CLEAN AGENT SYSTEM - TROUBLE | | X | | | | | | | | | | | | | | | | | | | | | | | |
| PRE-ACTION/CLEAN AGENT SYSTEM - SUPERVISORY | | X | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |

## SCHEDULE NOTES:

GENERAL NOTES:

1. ALL SIGNALS ANNUNCIATE AT A CONSTANTLY ATTENDED LOCATION.
2. ALL SIGNALS ARE SENT TO A CENTRAL STATION.
3. SEE CONTROL AND MONITOR MODULE SCHEDULES FOR ADDITIONAL INFORMATION

END OF SECTION

# Wauwatosa, WI

## Staff Report

**File #:** 24-0038 **Agenda Date:** 1/16/2024 **Agenda #:** 5.

Consideration of request by Director of Public Works for the acceptance of a permanent water main easement for the installation of a water main at 931-937 N. 123rd Street

**Submitted by:**
David Simpson
**Department**
Public Works

### A. Issue

Acceptance of a permanent water main easement located at 931-937 North 123rd Street for purposes of necessary water main construction related to the extension of a water main from 123rd Street to 124th Street.

### B. Background/Options

In conjunction with the approved agreements to service a portion of Elm Grove with Wauwatosa water, hydraulic studies were completed to determine the necessary level of water infrastructure improvements. As part of that analysis it was determined that connection of two existing dead end water mains is necessary to provide appropriate water service to the new service area as well as benefiting the existing service area near 123rd Street and 124th Street south of Watertown Plank Road. The new water main will be installed between the southern dead end of 123rd Street and the southern dead end of 124th Street. In order to accommodate this extension a 20 foot wide water main easement is needed from a portion of one property, 931-937 North 123rd Street. The easement is located within an area currently used as a driveway and parking for the property owner's tenant's use.

The property owner requested a monetary purchase arrangement so the Common Council initiated the formal process to acquire an easement in July of 2023. Through the current agreements between the City, Elm Grove, and the Developer, the cost for this acquisition will not be borne by the City of Wauwatosa.

Following approval by the Common Council, city staff hired a consultant to prepare the appropriate appraisal to establish the value of the easement and proceed through the acquisition process. The property owner has now agreed to the terms of the purchase and has signed the attached easement. Once accepted by the Board of Public Works and Common Council the property owner will be paid for the easement and the City will receive reimbursement from the Developer for the cost.

### C. Strategic Plan (Area of Focus)

N/A

## D. Fiscal Impact

There is no cost to the City for this acquisition, all consulting costs and acquisition costs will be paid for by the Developer through an existing agreement between the City and the Developer.

## E. Recommendation

It is recommended that the Common Council accept the attached twenty-foot-wide permanent water main easement located at 931-937 123rd Street.

***Recommendation:*** Common Council

**20' WIDE WATER MAIN EASEMENT**

Document Title

Document Number

This 20' Wide Water Main Easement ("Agreement") indenture is made effective as of the ___ day of _____, 2024 ("Effective Date"), by and between, Steven Bartos and Yuliya Bartos (hereinafter referred to as "Grantors"), and the City of Wauwatosa, a municipal corporation located in Milwaukee County, Wisconsin, hereinafter referred to as the "City." Grantors and the City may occasionally be referred to in this Agreement individually as a "Party" and collectively as the "Parties."

Recording Area

Name and Return Address:
City Clerk
City of Wauwatosa
7725 W. North Avenue
Wauwatosa, WI 53213

PIN: 377-0137-06

## RECITALS

WHEREAS, Steven Bartos and Yuliya Bartos owns certain real property which is located in the City of Wauwatosa, known as Parcel Number 377-0137-066, addressed as 931-937 North 123rd Street, Wauwatosa, WI and legally described as set forth in Exhibit A attached hereto and incorporated herein by reference ("Property")

WHEREAS, the City desires to install an underground water distribution system ("Water Main") under a portion of the Property in the area depicted on Exhibit B-1 and legally described on Exhibit B-2 attached hereto and incorporated herein (the "Easement Area");

WHEREAS, Grantors are willing to grant and the City desires to acquire, a permanent and perpetual underground easement over, under, into, on, across, through, and upon the Easement Area for the operation, use, maintenance, repair, and reconstruction of the Water Main, with the right of entry in and across the Property subject to the terms and conditions of this Agreement as set forth below.

## AGREEMENT

NOW, THEREFORE, in exchange for a purchase price of $15,900.00, receipt of which is hereby acknowledged, the Parties agree as follows:

1. Recitals. The above-referenced recitals are correct and hereby incorporated by reference.

2. Grant of Easement. Grantors hereby gives, grants and conveys to the City a twenty (20) foot wide perpetual easement, into, upon, under, across, on, over and through the Easement Area for the operation, use, maintenance repair, and reconstruction of the Water Main within the Easement Area (the "Water Main Easement").

3. Construction and Maintenance. The City will install Water Main in the Easement Area, and Grantors hereby consents to same. The City, at its own cost and expense, shall maintain and repair the Water Main and further agrees that any operation, use, maintenance and repair of the Water Main shall be in a manner as to not unreasonably interfere with the Grantors' use and enjoyment of the Property. It is an express condition of the granting of the Water Main Easement that the City will, at its expense, replace in substantially the same condition as it now is or may be so much of the surface or sub-surface of the soil, including any driveway, walkway, pedestrian sidewalk improvements or other paved areas of the Property as may be disturbed in the operation, use maintenance, repair, and reconstruction of the Water Main, and the execution of this Agreement by the City shall constitute an express acceptance by City of this condition to the granting of the Water Main Easement.

4. Consent to Entry and Use. Grantors consent to the entry of the City and its servants, employees, workers, agents, or independent contractors for and incidental to the operation, use, maintenance, repair, and reconstruction of the Water Main, but reserves to itself the right to make any use of the Easement Area which will not unreasonably disturb such Water Main or prevent ingress or egress thereto for the purpose of operation, use, maintenance, repair, and reconstruction thereof by the City. Construction of buildings, stoops, walls, fencing or permanent structures of any kind within the Easement Area is prohibited except that, notwithstanding the above, the parties specifically agree and acknowledge that driveways, walkways, surface parking, paved vehicular drive aisles, pedestrian sidewalk improvements, and other paved areas, whether existing now or to be constructed in the future, may be installed, maintained, repaired and replaced on or within the Easement Area.

5. Improvements. The City hereby approves of all improvements existing within the Easement Area as of the Effective Date. Grantors shall submit to the City plans for review and approval by the City for any proposed improvement, alteration or modification, including the placement of trees and shrubs, that Grantors would like to complete in the Easement Area. The City's review will be limited to compliance with City ordinances and preventing interference with the operation, use, maintenance, repair, and reconstruction of the Water Main. If approved, any additional improvements placed with the Easement Area will be constructed at the Grantors' risk, subject to the City's obligations under Section 3 of this Agreement.

6. Binding Effect. This indenture shall run with the land, and shall be binding upon and inure to the benefit of the parties hereto, their respective heirs, administrators, successors and assigns.

7. Governing Law. This indenture shall be governed by the laws of the State of Wisconsin. Any suit, proceeding, or other action arising out of or related to this Agreement shall be commenced and maintained only in a court of competent jurisdiction in the state court located in Milwaukee County, Wisconsin or federal court located in Milwaukee County, Wisconsin. Each party irrevocably consents to submit to the exclusive jurisdiction of such courts.

8. Indemnification. City, its successors, heirs, and assigns hereby indemnifies and holds harmless the Grantors from and against any and all suits, actions, legal or administrative proceedings, claims, demands, damages, liabilities, interest, attorneys' fees, costs, and expenses of whatsoever kind or nature ("Claims") which might arise or be asserted against the Grantors in connection with the City's construction, repair, maintenance, or use of the Water Main Easement or the Water Main, except that this provision shall not apply to the extent that the Claims result from or arise out of the sole negligence or willful misconduct of the Grantors. In the event a Claim subject to indemnity under this provision is asserted against the Grantors, the Grantors shall promptly notify the City, and the City shall defend, at its own expense, any suit based on such Claim. If any judgment or Claims subject to indemnity under this provision against the Grantors shall be allowed, the Grantors shall pay for all costs and expenses in connection herewith.

9. No Waiver. No waiver of, acquiescence in, or consent to any default in any term, covenant or condition of this indenture shall be construed as or constitute a waiver of, acquiescence in, or consent to any other, further, or succeeding default in the same or any other term, covenant or condition.

10. Amendment. No change or modification of this indenture shall be valid unless the same be in writing and signed by all of the parties hereto, or each of their respective heirs, successors, or assigns, and duly recorded in the Office of the Register of Deeds of Milwaukee County, Wisconsin.

11. Severability. All provisions of this indenture are deemed severable, and if any one or more provision is deemed unenforceable for any reason, the remaining provisions shall remain in full force and effect.

12. Other Easements. Nothing contained in this Agreement shall prevent Grantors from granting an easement or easements to any other governmental unit, public body, utility company or other third party within the Easement Area, without the City's prior approval, so long as such easement or easements does not substantially interfere with the City's use of the Water Main Easement as provided herein.

[SIGNATURES ON FOLLOWING PAGES]

IN WITNESS WHEREOF, Parties have executed this Agreement effective as of the Effective Date.

**GRANTORS:**

STEVEN BARTOS AND YULIYA BARTOS

By: Steven Bartos
Steven Bartos, Joint Owner

By: Yuliya Bartos
Yuliya Bartos, Joint Owner

STATE OF WISCONSIN )
Walworth ) ss
COUNTY OF ~~MILWAUKEE~~ )

Personally came before me this 5th day of January, 2024, the above-named Steven Bartos and Yuliya Bartos, and to me known to be the persons who executed the foregoing instrument.

Notary Public

Walworth County, Wisconsin
My Commission Expires: 1-18-27

OSCAR FLORES
Notary Public
State of Wisconsin

Accepted Pursuant to the Authority of Common Council on the ____day of _____, 2024

_____
Dennis McBride, Mayor

_____
Steven Braatz, City Clerk

STATE OF WISCONSIN )
) SS.
_____COUNTY )

Personally came before me this ____ day of _____, 2024, the above named Dennis McBride and Steven Braatz, Mayor and City Clerk, respectively, to me known to be the person who executed the foregoing instrument and acknowledged the same.

_____
Notary Public

_____County, Wisconsin
My Commission Expires: _____

This document was drafted by:
David Simpson
City of Wauwatosa
11100 W. Walnut Road
Wauwatosa, WI 53266

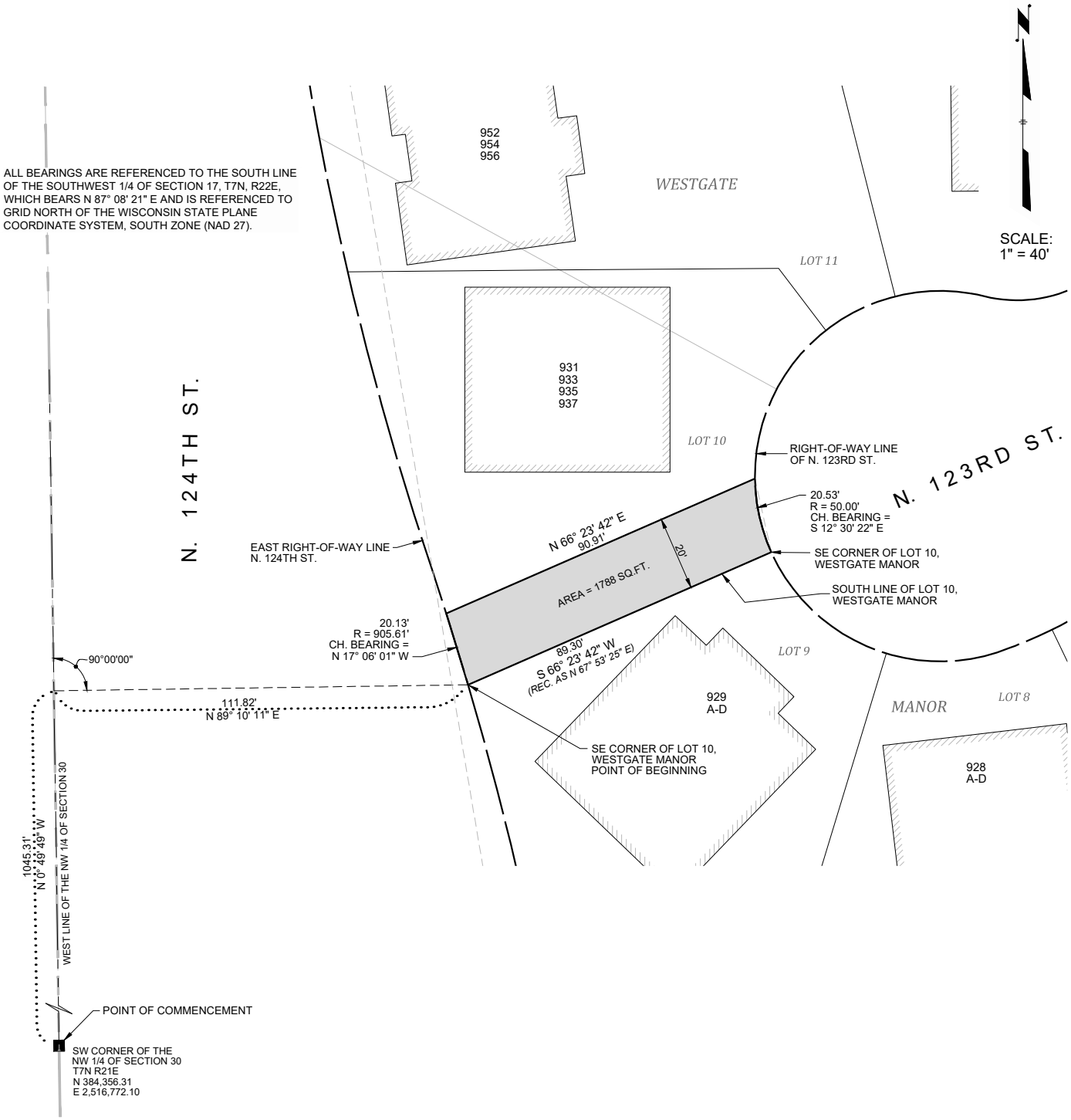
**EXHIBIT A**

LEGAL DESCRIPTION OF PROPERTY

WESTGATE MANOR, PART OF LOTS 10 & 11 COM SW COR LOT 10 TH NELY 89.30', TH NLY 66.43' ALG CUR, TH NWLY 21', TH WLY TO ELY LI N 124TH ST, TH SLY ALG SD ELY LI TP POB

PIN: Tax Parcel No. 377-0137-06, Tax Key 377-0137-006

# EXHIBIT B-1




PERMANENT WATER MAIN EASEMENT

CITY OF WAUWATOSA, WI
ENGINEERING DIVISION
MAY 2023

# EXHIBIT B-2

PERMANENT WATER MAIN EASEMENT

An easement located on Lot 10, Westgate Manor, a subdivision of record in the office of the Milwaukee County Register of Deeds, being in the Northwest 1/4 of Section 30, Township 7 North, Range 21 East, in the City of Wauwatosa, Milwaukee County, Wisconsin. Bounded and described as follows:

Commencing at the Southwest corner of the Northwest 1/4 of Section 30, Township 7 North, Range 21 East running thence N 00° 49' 49" W on and along the west line of said Northwest 1/4 Section 30 1045.31 feet to a point; thence N 89° 10' 11" E 111.82 feet to a point, point lies on the Southwest corner of Lot 10 of said Westgate Manor and is the point of beginning of the easement to be described; thence northwesterly 20.13 feet along a curve to the left, whose radius is 905.61 feet and whose chord bears N 17°06' 01" E and lies on the west line of said Lot 10 and the easterly right-of way line of North 124th Street to a point; thence N 66° 23' 42" E 90.91 feet to a point, point lies on the east line of said Lot 10 and the right-of-way line of North 123rd Street; thence 20.53 feet along a curve to the left whose radius is 50.00 feet and whose chord bears S 12° 30' 22" E to the Southeast corner of said Lot 10; thence S 66° 23' 43" E (recorded as N 67° 53' 25' E) on and along the south line of said Lot 10 to the point of beginning. Permanent water main easement contains 1788 square feet.

7725 W. North Avenue
Wauwatosa, WI 53213

# Wauwatosa, WI

## Staff Report

**File #:** 23-1358 **Agenda Date:** 1/16/2024 **Agenda #:** 6.

Monthly Pumpage Report November 2023

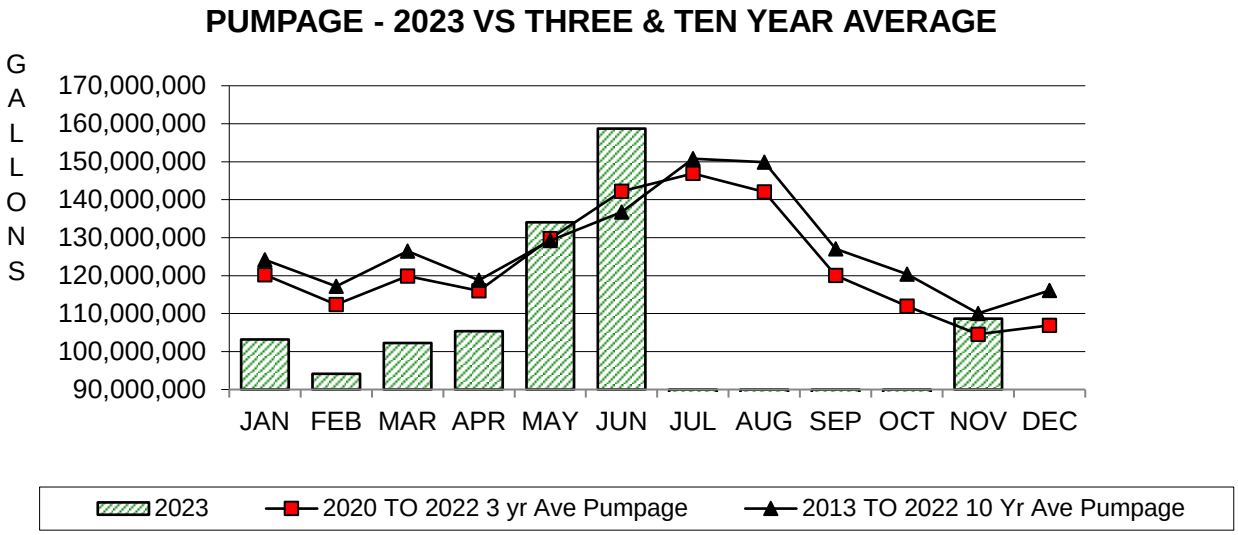
July - October 2023 pumpage numbers are not available as reporting equipment and software was undergoing repair.

December 20, 2023

Board of Public Works
City of Wauwatosa, Wisconsin

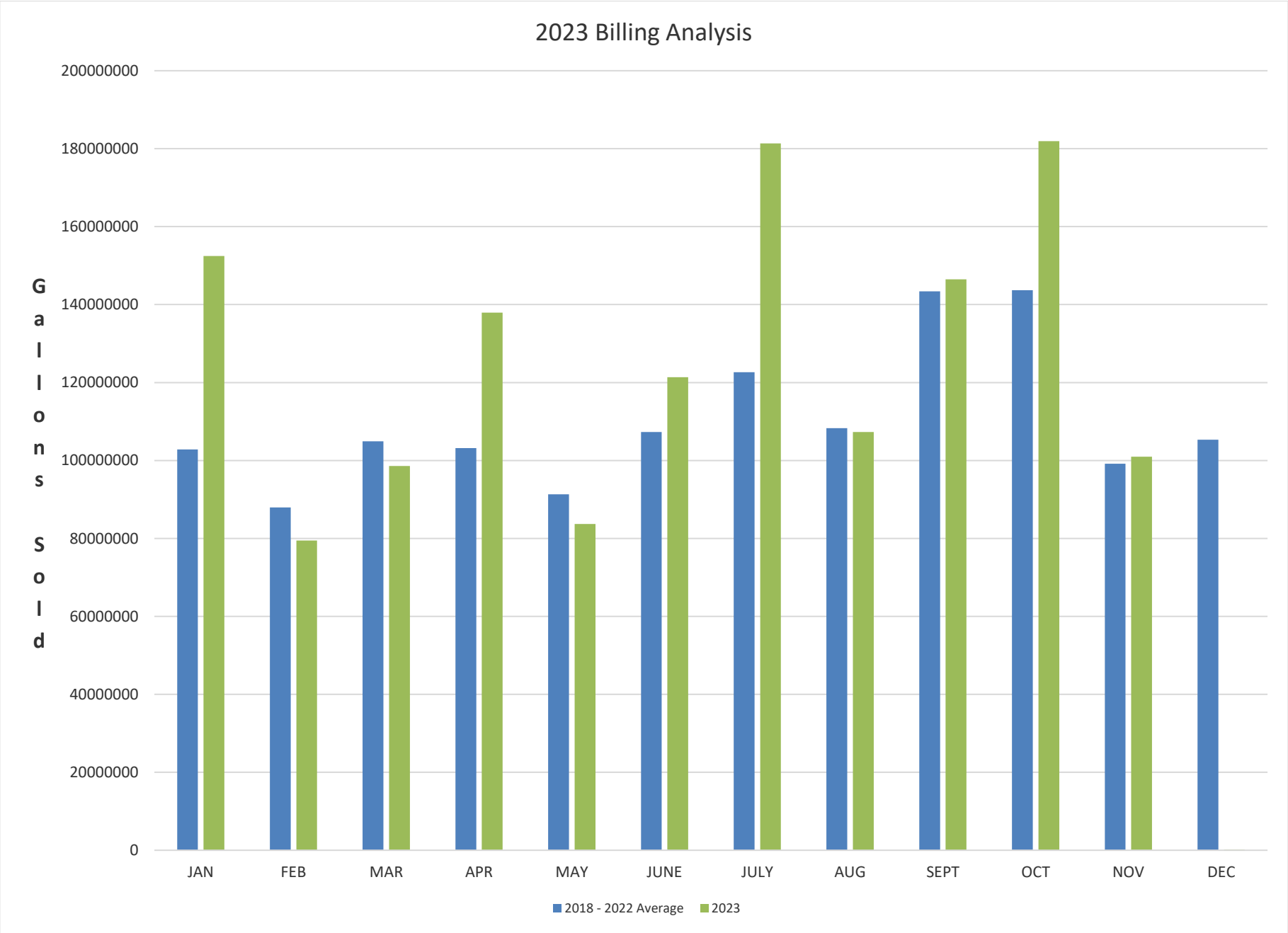
Dear Members:

Below is the pumpage in gallons for November of 2023.

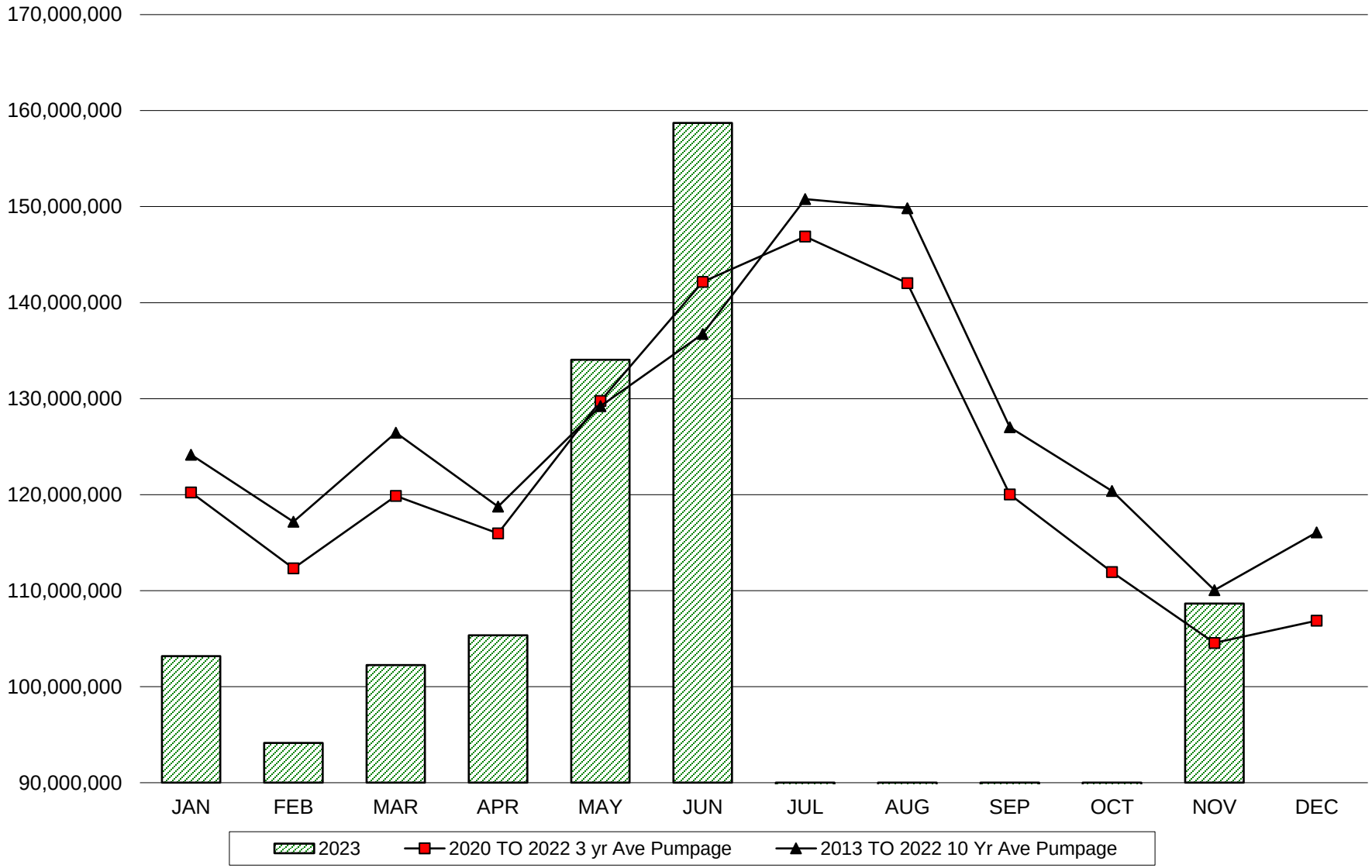



| MONTHS | 2023 | 2022 | 3 YEAR AVERAGE | 10 YEAR AVERAGE |
|---|---|---|---|---|
| January | 103,180,000 | 110,625,000 | 120,240,000 | 124,152,100 |
| February | 94,139,000 | 108,128,000 | 112,336,667 | 117,173,300 |
| March | 102,251,000 | 119,053,000 | 119,861,467 | 126,458,940 |
| April | 105,360,000 | 111,040,000 | 115,977,000 | 118,751,400 |
| May | 134,038,000 | 123,274,000 | 129,772,603 | 129,212,581 |
| June | 158,710,000 | 131,936,000 | 142,171,515 | 136,745,655 |
| July | - | 137,010,000 | 146,886,000 | 150,785,700 |
| August | - | 136,084,000 | 142,023,333 | 149,839,300 |
| September | - | 115,165,000 | 120,013,333 | 127,029,700 |
| October | - | 103,779,000 | 111,946,333 | 120,379,700 |
| November | 108,665,000 | 97,889,000 | 104,563,667 | 110,057,900 |
| December | | 103,055,000 | 106,870,667 | 116,068,700 |
| | 806,343,000 | 1,397,038,000 | 1,472,662,585 | 1,526,654,976 |

Very truly yours,
Adam Florin
Water Superintendent


2023 Billing Analysis
Gallons Sold
200000000
180000000
160000000
140000000
120000000
100000000
80000000
60000000
40000000
20000000
0
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEPT
OCT
NOV
DEC
2018 - 2022 Average
2023

# PUMPAGE - 2023 VS THREE & TEN YEAR AVERAGE



Wauwatosa Water Station Discharge Meters - Monthly Report

Month of November 2023

| DAY | 64th | Blanchard | Glenview | Potter | To System |
|---|---|---|---|---|---|
| 1 | 2,390,000 | 0 | 40,000 | 970,000 | 3,400,000 |
| 2 | 2,400,000 | 0 | 70,000 | 1,100,000 | 3,570,000 |
| 3 | 2,350,000 | 0 | 80,000 | 1,170,000 | 3,600,000 |
| 4 | 2,550,000 | 0 | 50,000 | 800,000 | 3,400,000 |
| 5 | 2,550,000 | 0 | 10,000 | 1,280,000 | 3,840,000 |
| 6 | 2,550,000 | 0 | 90,000 | 1,140,000 | 3,780,000 |
| 7 | 2,440,000 | 0 | 40,000 | 1,060,000 | 3,540,000 |
| 8 | 2,500,000 | 0 | 50,000 | 1,100,000 | 3,650,000 |
| 9 | 2,710,000 | 0 | 90,000 | 1,040,000 | 3,840,000 |
| 10 | 2,580,000 | 0 | 40,000 | 1,170,000 | 3,790,000 |
| 11 | 2,620,000 | 0 | 20,000 | 890,000 | 3,530,000 |
| 12 | 2,470,000 | 0 | 10,000 | 870,000 | 3,350,000 |
| 13 | 2,600,000 | 0 | 130,000 | 1,300,000 | 4,030,000 |
| 14 | 2,490,000 | 0 | 60,000 | 1,290,000 | 3,840,000 |
| 15 | 2,460,000 | 0 | 30,000 | 1,160,000 | 3,650,000 |
| 16 | 2,410,000 | 0 | 60,000 | 1,270,000 | 3,740,000 |
| 17 | 2,430,000 | 0 | 90,000 | 1,040,000 | 3,560,000 |
| 18 | 2,580,000 | 0 | 80,000 | 830,000 | 3,490,000 |
| 19 | 2,700,000 | 0 | 10,000 | 1,080,000 | 3,790,000 |
| 20 | 2,550,000 | 0 | 80,000 | 1,000,000 | 3,630,000 |
| 21 | 2,490,000 | 0 | 60,000 | 1,180,000 | 3,730,000 |
| 22 | 2,510,000 | 0 | 70,000 | 1,040,000 | 3,620,000 |
| 23 | 2,190,000 | 0 | 120,000 | 770,000 | 3,080,000 |
| 24 | 2,500,000 | 0 | 60,000 | 1,090,000 | 3,650,000 |
| 25 | 2,430,000 | 0 | 90,000 | 730,000 | 3,250,000 |
| 26 | 2,590,000 | 0 | 10,000 | 1,060,000 | 3,660,000 |
| 27 | 2,650,000 | 0 | 100,000 | 960,000 | 3,710,000 |
| 28 | 2,500,000 | 0 | 70,000 | 1,120,000 | 3,690,000 |
| 29 | 2,400,000 | 0 | 75,000 | 1,100,000 | 3,575,000 |
| 30 | 2,370,000 | 0 | 60,000 | 1,250,000 | 3,680,000 |
| 31 | 0 | 0 | 0 | 0 | 0 |
| Total | 74,960,000 | 0 | 1,845,000 | 31,860,000 | 108,665,000 |

# Wauwatosa, WI

## Staff Report

**File #:** 24-0064 **Agenda Date:** 1/16/2024 **Agenda #:** 7.

Acceptance of donation of remaining portion of Schoonmaker Reef National Historic Landmark to the City of Wauwatosa from Wangard Partners, LLC via quitclaim deed

**Submitted by:**
Alan Kesner, City Attorney
David Simpson, Director of Public Works
**Department:**
Attorney and Public Works

City staff are requesting the acceptance of the transfer of the remaining ortion of the Schoonmaker Reef National Historic Landmark to City Ownership. The current owner plans to complete this transfer in the next few weeks and would like to have the City's acceptance approved in advance in order to alleviate complications with upcoming transactions related to the land.

Schoonmaker Reef is a 425 million year-old fossil reef located in Wauwatosa that grew during the Silurian Period of Earth's history at a time when much of North America was covered by shallow tropical seas, located just north of State Street between 62nd and 66th Streets. It was declared a National Historic Landmark in 1997. Historically, the Reef has been on private land, so it has not been accessible by the public. There are many online resources describing the Reef and its history, but this one provides a good background:

<https://www.wuwm.com/environment/2016-05-27/did-you-know-theres-an-ancient-coral-reef-in-

In 2011, Derse Associates donated the eastern portion of the National Landmark area, approximately 2.4 acres, to the City of Wauwatosa. However, the most significant portions of the Reef, primarily the former quarry area which exposed many of the fossils for which the Reef is so well known, has remained in private ownership, and is currently owned by a subsidiary of Wangard Partners as part of the land on which The Reef Apartments has been developed. In conjunction with TIF assistance used as part of the Development of The Reef Apartments, Wangard agreed to donate the remaining land to the City at a future date in order to consolidate the City's ownership of this important National Landmark. This donation will consist of approximately 1.37 acres immediately west of the land already owned by the City. The donated area is shown on the attached deed and parcel description.

While the space cannot be opened to general public access due to security and safety concerns (the site has a history of individuals trespassing in order to illegally collect fossil samples from the site, further damaging the site with each such effort), the City has made the site available free of charge to school groups, educational organizations and for purposes of academic studies. The Director of Public Works is enthusiastic about creating a program moving forward to improve this access after the City owns the entire site, and is prepared to take this on as an addition to city-managed lands.

Since acquiring ownership of the former Derse parcel, the City has cleaned up the former quarry site, arranged for appropriate fencing and gates to protect this historic property (with some of that cost paid by Wangard), paved a secure parking area suitable for school buses, and demolished a former Derse office building on the site (<https://archive.jsonline.com/newswatch/wauwatosas-historic-schoonmaker-reef-undergoes-restoration-work-b99579010z1-328838971.html>). The City has also developed a paved accessible walkway with benches, providing access to the most significant portions of the Reef, including those located on the Wangard-owned property discussed above. The Historic Preservation Commission has recently arranged and contracted for the creation of interpretive signage to further expand the educational opportunities on the parcel.

The transaction requested today is the acceptance of ownership of the Western portion of the National Historic Landmark from the affiliate of Wangard Associates which currently owns The Reef Apartments, via Quitclaim deed. The deed and property descriptions are attached, and the transfer will be at no cost to the City. Transferring the property to the City will help to clean up the future obligations associated with Wangard's ownership of this land.

Requested Action:

Authorize appropriate city officials to accept the transfer of the land described on the attached draft quitclaim deed from Tosa Reef LLC on behalf of the City.

***Recommendation:*** Common Council

Document Number

State Bar of Wisconsin Form 3-2003

# QUIT CLAIM DEED

Document Name

**THIS DEED**, made between TOSA REEF, LLC, a Wisconsin limited liability company, TOSA REEF TIF CORP., a Wisconsin corporation, and SW 2018 1, LLC, a Wisconsin limited liability company * ("Grantor," whether one or more), and CITY OF WAUWATOSA, a Wisconsin municipal corporation ("Grantee," whether one or more).

Grantor quit claims to Grantee the following described real estate, together with the rents, profits, fixtures and other appurtenant interests, in Milwaukee County, State of Wisconsin ("Property") (if more space is needed, please attach addendum):

See exhibit a for legal description.

* as tenants in common

Recording Area

Name and Return Address

City of Wauwatosa
7725 West North Avenue
Wauwatosa, Wisconsin 53226
Attn: City Attorney

Part of 3840020000
Parcel Identification Number (PIN)

This is not homestead property.
~~(is)~~ (is not)

Dated _____ .

SIGNATURES APPEAR ON FOLLOWING PAGES

_____(SEAL) _____(SEAL)
* _____ * _____

_____(SEAL) _____(SEAL)
* _____ * _____

**AUTHENTICATION**

Signature(s)_____
_____
authenticated on_____.

_____
*
TITLE: MEMBER STATE BAR OF WISCONSIN
(If not,_____
authorized by Wis. Stat. § 706.06)

THIS INSTRUMENT DRAFTED BY:
Timothy J. Voeller, Esq.
Wangard Partners, Inc.

**ACKNOWLEDGMENT**

STATE OF WISCONSIN )
) ss.
Milwaukee COUNTY )

Personally came before me on _____,
the above-named Stewart M. Wangard, Manager of Tosa Reef, LLC
to me known to be the person(s) who executed the foregoing instrument and acknowledged the same.

_____
*
Notary Public, State of Wisconsin
My Commission (is permanent) (expires:_____)

**(Signatures may be authenticated or acknowledged. Both are not necessary.)**

**NOTE: THIS IS A STANDARD FORM. ANY MODIFICATIONS TO THIS FORM SHOULD BE CLEARLY IDENTIFIED.**



* Type name below signatures.

Reset

SIGNATURE PAGES FOR QUIT CLAIM DEED

TOSA REEF, LLC

By: _____
Stewart M. Wangard, Manager

STATE OF WISCONSIN )
) SS
COUNTY OF MILWAUKEE )

On this ____ day of _____, 2024, before me appeared Stewart M. Wangard, to me personally known, who, being by me duly sworn, did say that he is the Manager of Tosa Reef, LLC, and that said instrument was signed on behalf of said company by his authority, and said person acknowledged said instrument to be the free act and deed of said company.

In Testimony Whereof, I have hereunto set my hand and affixed my official seal the day and year first above written.

_____
Name: _____
Notary Public, State of Wisconsin
My Commission Expires: _____

[SEAL]

[SIGNATURES CONTINUE ON FOLLOWING PAGE]

TOSA REEF TIF CORP.

By: _____
Stewart M. Wangard
Director and Sole Member

STATE OF WISCONSIN )
) SS
COUNTY OF MILWAUKEE )

On this ____ day of _____, 2024, before me appeared Stewart M. Wangard, to me personally known, who, being by me duly sworn, did say that he is the Director and Sole Member of Tosa Reef TIF Corp., and that said instrument was signed on behalf of said company by his authority, and said person acknowledged said instrument to be the free act and deed of said company.

In Testimony Whereof, I have hereunto set my hand and affixed my official seal the day and year first above written.

_____
Name: _____
Notary Public, State of Wisconsin
My Commission Expires: _____

[SEAL]

[SIGNATURES CONTINUE ON FOLLOWING PAGE]

SW 2018 1, LLC

By: _____
Stewart M. Wangard, Sole Member

STATE OF WISCONSIN )
) SS
COUNTY OF MILWAUKEE )

On this ____ day of _____, 2024,, before me appeared Stewart M. Wangard, to me personally known, who, being by me duly sworn, did say that he is the Sole Member of SW 2018 1, LLC, and that said instrument was signed on behalf of said company by his authority, and said person acknowledged said instrument to be the free act and deed of said company.

In Testimony Whereof, I have hereunto set my hand and affixed my official seal the day and year first above written.

_____
Name: _____
Notary Public, State of Wisconsin
My Commission Expires: _____

[SEAL]

EXHIBIT A

LEGAL DESCRIPTION

Being a part of Lot 1 of Certified Survey Map No. 8617, in the southwest ¼ and southeast ¼ of the southeast ¼ of Section 22, Town 7 North, Range 21 East, in the City of Wauwatosa, County of Milwaukee, State of Wisconsin, described as follows:

Beginning at the northwest corner of Lot 2 of said Certified Survey Map; thence N 1°46’56” W, along the west line of said Lot 1, 30.06 feet; thence S 88°49’44” W, along the south line of said Lot 1, 33.77 feet; thence N 1°39’26” W, along said west line, 75.62 feet to the north line of said Lot 1; thence N 88°47’06” E along said north line, 299.89 feet; thence N 77°49’52” E, continuing along said north line, 139.85 feet to the east line of said Lot 1; thence S 1°39’38” E along said east line, 126.68 feet to the north line of said Lot 1; thence N 88°56’50” E, along said north line, 300.59 feet; thence S 1°46’50” E, 16.62 feet; thence S 88°58’01” W, 103.67 feet; thence S 0°48’16” E, 15.39 feet; thence S 88°57’47” W, 340.50 feet; thence N 50°58’02” W, 32.33 feet; thence N 90°00’00” W, along the north line of said Lot 2, 235.38 feet to the point of beginning.

Containing 59,773 square feet (1.37220 Acres)

7725 W. North Avenue
Wauwatosa, WI 53213

# Wauwatosa, WI

## Staff Report

**File #:** 24-0002 **Agenda Date:** 1/16/2024 **Agenda #:** 8.

Consideration of ratification of project partial payments for work completed pursuant to the terms of the contract

BE IT RESOLVED, By the Board of Public Works of the City of Wauwatosa, Wisconsin that the proper City Officers be and they are hereby authorized and directed to issue City orders in favor of the contractor listed below in the amount listed in the column headed "Amount" as partial payment for work completed pursuant to the terms of the contract noted.

**Contractor:** Midwest General & Mechanical Contractors, Inc.
**Payment No.:** 5
**Contract/Project No.:** 21-55/5101 Blanchard Street Pumping Station Modifications
**Amount:** $309,881.00

**Contractor:** Visu-Sewer, Inc.
**Payment No.:** 3
**Contract/Project No.:** 22-78 - 2022 Sanitary Sewer Improvements No 1
**Amount:** $129,388.72

**Contractor:** Visu-Sewer, Inc.
**Payment No.:** 2
**Contract/Project No.:** 22-79 - 2022 Sanitary Sewer Improvements No 2
**Amount:** $466,122.69

**Contractor:** Visu-Sewer, Inc.
**Payment No.:** 2
**Contract/Project No.:** 23-78 - 2023 Sanitary Sewer Improvements
**Amount:** $277,482.48

7725 W. North Avenue
Wauwatosa, WI 53213

# Wauwatosa, WI

## Staff Report

**File #:** 24-0003 **Agenda Date:** 1/16/2024 **Agenda #:** 9.

Project Updates

**Submitted by:**
Nick Deming, Construction Manager
**Department:**
Engineering Division

**Project 1107 - North Avenue Reconstruction**
- Punch list work and final landscaping to resume in Spring 2024.

**23-07 - 115th St.**
- Awaiting delivery of backordered light poles. Installation is expected to take place once poles are available in winter of 2024.

**23-90 - 2023 Fiber**
- Work is expected to resume in Spring of 2024.

**Elm Grove Water Main Extension**
- The remaining water main work is expected to resume in Spring of 2024.

# Board of Public Works Application

City of Wauwatosa
7725 West North Avenue
Wauwatosa, WI 53213
414-479-8907
www.wauwatosa.net

***Property Information***

Project Address: 6330 W. North Avenue, Wauwatosa WI 53213

***Applicant or Agent Information***

Name Nick Carnahan

Company Galbraith Carnahan Architec

Address 6404 W. North Ave.

City Wauwatosa State WI Zip 53213

Phone 414-291-0772

Email nac@galbraithcarnahan.com

***Property Owner Information***

Name Dave Tamburrino

Company DAPK LLC

Address 2463 N. 67th Street

City Wauwatosa State WI Zip 53213

Phone 414-731-4525

Email davetambo@yahoo.com

## APPLICATION TYPE

All fees are $100 unless noted.

- ☐ Encroachment
- ☐ Air Condenser Location
- ☐ Well abandonment
- ☐ City Co-Location
- ☐ Swimming Pool Location
- ☐ Property Maintenance Appeal
- ☑ Landscape Appeal
- ☐ Neighborhood Association Signs
- ☐ Extension of Work Hours
- ☐ Other
- ☐ Site Plan Appeal
- ☐ Commercial Fence Appeal
- ☐ ROW Construction Staging
- ☐ Parking Exception **$150**

*Make checks payable to: City of Wauwatosa*

***This application must be completed and filed with the Development Office and is required for Board of Public Works review.***

***Proposed Request-*** Specify reason for petition and what particular hardships are involved. Examples: insufficient lot area, insufficient front, side or rear setback, placement of equipment would decrease efficiency, etc.

See attached memorandum.

Applicant or Agent Signature: Nick Carnahan Digitally signed by Nick Carnahan Date: 2023.12.14 15:35:58 -06'00' Date: 12-14-23

**FOR CITY USE ONLY:**

Accepted by _____

Date _____

Zoning District _____

Aldermanic District _____

MT# _____

Fee

Amount Paid _____

Receipt # _____

Date paid _____

Updated December 2021

Meeting Dates

BPW _____

Council _____

Other _____

(over)

## ***BOARD OF PUBLIC WORKS APPLICATION DEADLINES***

| **APPLICATION DEADLINE** | **BOARD OF PUBLIC WORKS @ 8:30 AM** |
|---|---|
| January 5, 2023…… | January 17, 2023 (Tuesday) |
| January 26, 2023…… | February 6, 2023 |
| February 9, 2023 …… | February 20, 2023 |
| February 23, 2023…… | March 6, 2023 |
| March 9, 2023 …… | March 20, 2023 |
| March 23, 2023 …… | April 3, 2023 |
| April 6, 2023 …… | April 17, 2023 |
| April 20, 2023 …… | May 1, 2023 |
| May 4, 2023 …… | May 15, 2023 |
| May 25, 2023 …… | June 5, 2023 |
| June 8, 2023 …… | June 20, 2023 (Tuesday) |
| June 22, 2023 …… | July 3, 2023 |
| July 6, 2023 …… | July 17, 2023 |
| July 20, 2023 …… | July 31, 2023 |
| August 24,2023 …… | September 5, 2023 (Tuesday) |
| September 7, 2023 …… | September 18, 2023 |
| September 21, 2023 …… | October 2, 2023 |
| October 5, 2023 …… | October 16, 2023 |
| October 26, 2023 …… | November 6, 2023 |
| November 9, 2023 …… | November 20, 2023 |
| November 22, 2023…… | December 4, 2023 |
| December 7, 2023 …… | December 18, 2023 |
| December 21, 2023…… | January 2, 2024 (Tuesday) |
| January 4, 2023…… | January 16, 2024 (Tuesday) |

*See handout for complete approval process



(over)