BID OF_____

2015

PROPOSAL, CONTRACT, BOND AND SPECIFICATIONS

FOR

RECONSTRUCTION OF THE MADISON WATER UTILITY OPERATIONS CENTER

110 S. PATERSON STREET
JUNE 12, 2015
VOLUME 1 OF 2

CONTRACT NO. 7529

PROJECT NO. 10442

MUNIS NO. 10442-86-140:53310

IN

MADISON, DANE COUNTY, WISCONSIN

AWARDED BY THE COMMON COUNCIL
MADISON, WISCONSIN ON_____

CITY ENGINEERING DIVISION
1600 EMIL STREET
MADISON, WISCONSIN 53713

https://bidexpress.com/login

RECONSTRUCTION OF THE MADISON WATER UTILITY OPERATIONS CENTER
110 S. PATERSON STREET
JUNE 12, 2015
CONTRACT NO. 7529
VOLUME 1 OF 2

INDEX

VOLUME 1 of 2

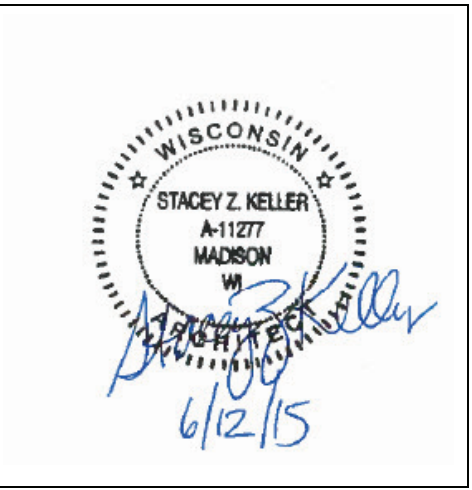
VOLUME 2 of 2

This Proposal, and Agreement have
been prepared by:

MADISON WATER UTILITY
CITY OF MADISON
MADISON, DANE COUNTY, WISCONSIN

6-12-15

Al Larson, P.E., BCEE, Principal Engineer

CIVIL ENGINEER Mead & Hunt, Inc. 2440 Deming Way Middleton, WI 53562 Tel: 608.273.6390 Fax: 608.273.6391	
STRUCTURAL ENGINEER GRAEF 5126 West Terrace Drive Madison, WI 53718 Tel: 608-242-1550	
ARCHITECT Mead & Hunt, Inc. 2440 Deming Way Middleton, WI 53562 Tel: 608.273.6390 Fax: 608.273.6391	

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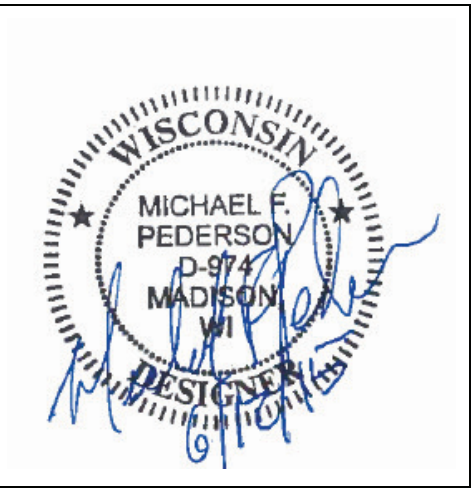
PLUMBING ENGINEER Mead & Hunt, Inc. 2440 Deming Way Middleton, WI 53562 Tel: 608.273.6390 Fax: 608.273.6391	

MECHANICAL ENGINEER Mead & Hunt, Inc. 2440 Deming Way Middleton, WI 53562 Tel: 608.273.6390 Fax: 608.273.6391	

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LANDSCAPE ARCHITECT Ken Saiki Design 303 S. Paterson Street, Suite 1 Madison, WI 53703 Tel: 608.251.3600 Fax: 608.251.2330	

END OF SECTION 000107

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SECTION A: ADVERTISEMENT FOR BIDS AND INSTRUCTIONS TO BIDDERS

REQUEST FOR BID FOR PUBLIC WORKS CONSTRUCTION
CITY OF MADISON, WISCONSIN

A BEST VALUE CONTRACTING MUNICIPALITY

PROJECT NAME:	RECONSTRUCTION OF THE MADISON WATER UTILITY OPERATIONS CENTER **110 S. PATERSON STREET** JUNE 12, 2015
CONTRACT NO.:	7529
SBE GOAL	15%
BID BOND	5%
PRE BID ON SITE WALK-THRU (1:00 P.M.)	June 18, 2015
PRE BID MEETING (1:00 P.M.)	July 3, 2015
PREQUALIFICATION APPLICATION DUE (1:00 P.M)	July 3, 2015
BID SUBMISSION (1:00 P.M.)	July 10, 2015
BID OPEN (1:30 P.M.)	July 10, 2015
PUBLISHED IN WSJ	6/12, 6/19, 6/26 & 7/3

PRE BID ON SITE WALK-THRU: Representatives of the design team and the City of Madison Water Utility will be present to discuss the requirements of the project and allow contractors to review the existing conditions of the site. This meeting is not required to bid, but is highly recommended. This meeting will take place at 110 S. Paterson Street, Madison, Wisconsin.

PRE BID MEETING: Representatives of the Affirmative Action Department will be present to discuss the Small Business Enterprise requirements at 1600 Emil Street, Madison Wisconsin.

PREQUALIFICATION APPLICATION: Forms are available on our website, www.cityofmadison.com/business/pw/forms.cfm. If not currently prequalified in the categories listed in Section A, an amendment to your Prequalification will need to be submitted prior to the same due date. Postmark is not applicable.

BIDS TO BE SUBMITTED by hand to 1600 EMIL ST., MADISON, WI 53713 or online at www.bidexpress.com.

THE BID OPENING is at 1600 EMIL ST., MADISON, WI 53713.

STANDARD SPECIFICATIONS

The City of Madison's Standard Specifications for Public Works Construction - 2015 Edition, as supplemented and amended from time to time, forms a part of these contract documents as if attached hereto.

These standard specifications are available on the City of Madison Public Works website, www.cityofmadison.com/Business/PW/specs.cfm.

The Contractor shall review these Specifications prior to preparation of proposals for the work to be done under this contract, with specific attention to Article 102, "BIDDING REQUIREMENTS AND CONDITIONS" and Article 103, "AWARD AND EXECUTION OF THE CONTRACT." For the convenience of the bidder, below are highlights of three subsections of the specifications.

SECTION 102.1: PRE-QUALIFICATION OF BIDDERS

In accordance with Wisconsin State Statutes 66.0901 (2) and (3), all bidders must submit to the Board of Public Works proof of responsibility on forms furnished by the City. The City requires that all bidders be qualified on a biennial basis.

Bidders must present satisfactory evidence that they have been regularly engaged in the type of work specified herein and they are fully prepared with necessary capital, materials, machinery and supervisory personnel to conduct the work to be contracted for to the satisfaction of the City. All bidders must be pre-qualified by the Board of Public Works for the type of construction on which they are bidding prior to the opening of the bid.

In accordance with Section 39.02(9)(a)l. of the General Ordinances, all bidders shall submit in writing to the Affirmative Action Division Manager of the City of Madison, a Certificate of Compliance or an Affirmative Action Plan at the same time or prior to the submission of the proof of responsibility forms.

The bidder shall be disqualified if the bidder fails to or refuses to, prior to opening of the bid, submit a Certificate of compliance, Affirmative Action Plan or Affirmative Action Data Update, as applicable, as defined by Section 39.02 of the General Ordinances (entitled Affirmative Action) and as required by Section 102.11 of the Standard Specifications.

SECTION 102.4 PROPOSAL

No bid will be accepted that does not contain an adequate or reasonable price for each and every item named in the Schedule of Unit Prices.

A lump sum bid for the work in accordance with the plans and specifications is required. The lump sum bid must be the same as the total amounts bid for the various items and it shall be inserted in the space provided.

All papers bound with or attached to the proposal form are considered a part thereof and must not be detached or altered when the proposal is submitted. The plans, specifications and other documents designated in the proposal form will be considered a part of the proposal whether attached or not.

A proposal submitted by an individual shall be signed by the bidder or by a duly authorized agent. A proposal submitted by a partnership shall be signed by a member/partner or by a duly authorized agent thereof. A proposal submitted by a corporation shall be signed by an authorized officer or duly authorized registered agent of such corporation, and the proposal shall show the name of the State under the laws of which such corporation was chartered. The required signatures shall in all cases appear in the space provided thereof on the proposal.

Each proposal shall be placed, together with the proposal guaranty, in a sealed envelope, so marked as to indicate name of project, the contract number or option to which it applies, and the name and address of the Contractor or submitted electronically through Bid Express (www.bidexpress.com). Proposals will be accepted at the location, the time and the date designated in the advertisement. Proposals received after the time and date designated will be returned to the bidder unopened.

The Bidder shall execute the Disclosure of Ownership form. REFER TO SECTION F.

SECTION 102.5: BID DEPOSIT (PROPOSAL GUARANTY)

All bids, sealed or electronic, must be accompanied with a Bid Bond equal to at least 5% of the bid or a Certificate of Annual/Biennial Bid Bond or certified check, payable to the City Treasurer. Bid deposit of the successful bidders shall be returned within forty-eight (48) hours following execution of the contract and bond as required.

PREVAILING WAGE RATES

Prevailing Wage Rates may be required and are attached in Section J of the contract. See Special Provisions to determine applicability.

Bidders for this Contract(s) must be Pre-Qualified for at least one of the following type(s) of construction denoted by an ☒

Building Demolition

101 ☐ Asbestos Removal
120 ☐ House Mover
110 ☐ Building Demolition

Street, Utility and Site Construction

201 ☐ Asphalt Paving
205 ☐ Blasting
210 ☐ Boring/Pipe Jacking
215 ☐ Concrete Paving
220 ☐ Con. Sidewalk/Curb & Gutter/Misc. Flat Work
221 ☐ Concrete Bases and Other Concrete Work
222 ☐ Concrete Removal
225 ☐ Dredging
230 ☐ Fencing
235 ☐ Fiber Optic Cable/Conduit Installation
240 ☐ Grading and Earthwork
241 ☐ Horizontal Saw Cutting of Sidewalk
242 ☐ Infrared Seamless Patching
245 ☐ Landscaping, Maintenance
250 ☐ Landscaping, Site and Street
251 ☐ Parking Ramp Maintenance
252 ☐ Pavement Marking
255 ☐ Pavement Sealcoating and Crack Sealing
260 ☐ Petroleum Above/Below Ground Storage Tank Removal/Installation
262 ☐ Playground Installer
265 ☐ Retaining Walls, Precast Modular Units
270 ☐ Retaining Walls, Reinforced Concrete
275 ☐ Sanitary, Storm Sewer and Water Main Construction
276 ☐ Sawcutting
280 ☐ Sewer Lateral Drain Cleaning/Internal TV Insp.
285 ☐ Sewer Lining
290 ☐ Sewer Pipe Bursting
295 ☐ Soil Borings
300 ☐ Soil Nailing
305 ☐ Storm & Sanitary Sewer Laterals & Water Svc.
310 ☐ Street Construction
315 ☐ Street Lighting
318 ☐ Tennis Court Resurfacing
320 ☐ Traffic Signals
325 ☐ Traffic Signing & Marking
332 ☐ Tree pruning/removal
333 ☐ Tree, pesticide treatment of
335 ☐ Trucking
340 ☐ Utility Transmission Lines including Natural Gas, Electrical & Communications
399 ☐ Other_____

Bridge Construction

501 ☐ Bridge Construction and/or Repair

Building Construction

401 ☐ Floor Covering (including carpet, ceramic tile installation, rubber, VCT
402 ☐ Building Automation Systems
403 ☐ Concrete
404 ☐ Doors and Windows
405 ☐ Electrical - Power, Lighting & Communications
410 ☐ Elevator - Lifts
412 ☐ Fire Suppression
413 ☐ Furnishings - Furniture and Window Treatments
415 ☐ General Building Construction, Equal or Less than $250,000
420 ☐ General Building Construction, $250,000 to $1,500,000
425 ☒ General Building Construction, Over $1,500,000
428 ☐ Glass and/or Glazing
429 ☐ Hazardous Material Removal
430 ☐ Heating, Ventilating and Air Conditioning (HVAC)
433 ☐ Insulation - Thermal
435 ☐ Masonry/Tuck pointing
437 ☐ Metals
440 ☐ Painting and Wallcovering
445 ☐ Plumbing
450 ☐ Pump Repair
455 ☐ Pump Systems
460 ☐ Roofing and Moisture Protection
464 ☐ Tower Crane Operator
461 ☐ Solar Photovoltaic/Hot Water Systems
465 ☐ Soil/Groundwater Remediation
466 ☐ Warning Sirens
470 ☐ Water Supply Elevated Tanks
475 ☐ Water Supply Wells
480 ☐ Wood, Plastics & Composites - Structural & Architectural
499 ☐ Other_____
_____

State of Wisconsin Certifications

1 ☐ Class 5 Blaster - Blasting Operations and Activities 2500 feet and closer to inhabited buildings for quarries, open pits and road cuts.
2 ☐ Class 6 Blaster - Blasting Operations and Activities 2500 feet and closer to inhabited buildings for trenches, site excavations, basements, underwater demolition, underground excavations, or structures 15 feet or less in height.
3 ☐ Class 7 Blaster - Blasting Operations and Activities for structures greater than 15 ' in height, bridges, towers, and any of the objects or purposes listed as “Class 5 Blaster or Class 6 Blaster”.
4 ☐ Petroleum Above/Below Ground Storage Tank Removal and Installation (Attach copies of State Certifications.)
5 ☐ Hazardous Material Removal (Contractor to be certified for asbestos and lead abatement per the Wisconsin Department of Health Services, Asbestos and Lead Section (A&LS).) See the following link for application: www.dhs.wisconsin.gov/Asbestos/Cert. State of Wisconsin Performance of Asbestos Abatement Certificate must be attached.
6 ☐ Certification number as a Certified Arborist or Certified Tree Worker as administered by the International Society of Arboriculture
7 ☐ Pesticide application (Certification for Commercial Applicator For Hire with the certification in the category of turf and landscape (3.0) and possess a current license issued by the DATCP)
8 ☐ State of Wisconsin Master Plumbers License.

SECTION B: PROPOSAL

Please refer to the Bid Express Website at https://bidexpress.com look up contract number and go to Section B: Proposal Page

You can access all City of Madison bid solicitations for FREE at www.bidexpress.com

Click on the "Register for Free" button and follow the instructions to register your company and yourself. You will be asked for a payment subscription preference, since you may wish to bid online someday. Simply choose the method to pay on a 'per bid' basis. This requires no payment until / unless you actually bid online. You can also choose the monthly subscription plan at this time. You will, however, be asked to provide payment information. Remember, you can change your preference at anytime. You will then be able to complete your free registration and have full access to the site. Your free access does not require completion of the 'Digital ID' process, so you will have instant access for viewing and downloading. To be prepared in case you ever do wish to bid online, you may wish to establish your digital ID also, since you cannot bid without a Digital ID.

If you have any problems with the free registration process, you can call the bidexpress help team, toll free at 1-888-352-2439 (option 1, option1).

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SECTION C: SMALL BUSINESS ENTERPRISE

Instructions to Bidders
City of Madison
SBE Program Information

2 Small Business Enterprise (SBE) Program Information

2.1 Policy and Goal

The City of Madison reaffirms its policy of nondiscrimination in the conduct of City business by maintaining a procurement process which remains open to all who have the potential and ability to sell goods and services to the City. It is the policy of the City of Madison to allow Small Business Enterprises (SBE) maximum feasible opportunity to participate in City of Madison contracting. The bidder acknowledges that its bid has been submitted in accordance with the SBE program and is for the public's protection and welfare.

Please refer to the "ADVERTISEMENT FOR BIDS" for the goal for the utilization of SBEs on this project. SBEs may participate as subcontractors, vendors and/or suppliers, which provide a commercially useful function. The dollar value for SBE suppliers or 'materials only' vendors shall be discounted to 60% for purposes of meeting SBE goals.

A bidder which achieves or exceeds the SBE goal will be in compliance with the SBE requirements of this project. In the event that the bidder is unable to achieve the SBE goal, the bidder must demonstrate that a good faith effort to do so was made. Failure to either achieve the goal or demonstrate a good faith effort to do so will be grounds for the bidder being deemed a non-responsible contractor ineligible for award of this contract.

A bidder may count towards its attainment of the SBE goal only those expenditures to SBEs that perform a commercially useful function. For purposes of evaluating a bidder's responsiveness to the attainment of the SBE goal, the contract participation by an SBE is based on the percentage of the total base bid proposed by the Contractor. The total base bid price is inclusive of all addenda.

Work performed by an SBE firm in a particular transaction can be counted toward the goal only if it involves a commercially useful function. That is, in light of industry practices and other relevant considerations, does the SBE firm have a necessary and useful role in the transaction, of a kind for which there is a market outside the context of the SBE Program, or is the firm's role a superfluous step added in an attempt to obtain credit towards goals? If, in the judgment of the Affirmative Action Division, the SBE firm will not perform a commercially useful function in the transaction, no credit towards goals will be awarded.

The question of whether a firm is performing a commercially useful function is completely separate from the question of whether the firm is an eligible SBE. A firm is eligible if it meets the definitional criteria and ownership and control requirements, as set forth in the City of Madison's SBE Program.

If the City of Madison determines that the SBE firm is performing a commercially useful function, then the City of Madison must then decide what that function is. If the commercially useful function is that of an SBE vendor / supplier that regularly transacts business with the respective product, then the City of Madison will count 60% of the value of the product supplied toward SBE goals.

To be counted, the SBE vendor / supplier must be engaged in selling the product in question to the public. This is important in distinguishing an SBE vendor / supplier, which has a regular trade with a variety of customers, from a firm which performs supplier-like functions on an ad hoc basis or for only one or two contractors with whom it has a special relationship.

A supplier of bulk goods may qualify as an eligible SBE vendor / supplier if it either maintains an inventory or owns or operates distribution equipment. With respect to the distribution equipment; e.g., a fleet of trucks, the term "operates" is intended to cover a situation in which the supplier leases the equipment on a regular basis for its entire business. It is not intended to cover a situation in which the firm simply provides drivers for trucks owned or leased by another party; e.g., a prime contractor, or leases such a party's trucks on an ad hoc basis for a specific job.

If the commercially useful function being performed is not that of a qualified SBE vendor / supplier, but rather that of delivery of products, obtaining bonding or insurance, procurement of personnel, acting as a broker or manufacturer's representative in the procurement of supplies, facilities, or materials, etc., only the fees or commissions will apply towards the goal.

For example, a business that simply transfers title of a product from manufacturer to ultimate purchaser; e. g., a sales representative who re-invoices a steel product from the steel company to the Contractor, or a firm that puts a product into a container for delivery would not be considered a qualified SBE vendor / supplier. The Contractor would not receive credit based on a percentage of the cost of the product for working with such firms.

Concerning the use of services that help the Contractor obtain needed supplies, personnel, materials or equipment to perform a contract: only the fee received by the service provider will be counted toward the goal. For example, use of a SBE sales representative or distributor for a steel company, if performing a commercially useful function at all, would entitle the Contractor receiving the steel to count only the fee paid to the representative or distributor toward the goal. This provision would also govern fees for professional and other services obtained expressly and solely to perform work relating to a specific contract.

Concerning transportation or delivery services: if an SBE trucking company picks up a product from a manufacturer or a qualified vendor / supplier and delivers the product to the Contractor, the commercially useful function it is performing is not that of a supplier, but simply that of a transporter of goods. Unless the trucking company is itself the manufacturer or a qualified vendor / supplier in the product, credit cannot be given based on a percentage of the cost of the product. Rather, credit would be allowed for the cost of the transportation service.

The City is aware that the rule's language does not explicitly mention every kind of business that may contribute work on this project. In administering these programs, the City would, on a case-by-case basis, determine the appropriate counting formula to apply in a particular situation.

2.2 Contract Compliance

Questions concerning the SBE Program shall be directed to the Contract Compliance Officer of the City of Madison Department of Civil Rights, Affirmative Action Division, 210 Martin Luther King, Jr. Blvd., Room 523, Madison, WI 53703; telephone (608) 266-4910.

2.3 Certification of SBE by City of Madison

The Affirmative Action Division maintains a directory of SBEs which are currently certified as such by the City of Madison. Contact the Contract Compliance Officer as indicated in Section 2.2 to receive a copy of the SBE Directory or you may access the SBE Directory online at www.cityofmadison.com/dcr/aaTBDir.cfm.

All contractors, subcontractors, vendors and suppliers seeking SBE status must complete and submit the **Targeted Business Certification Application** to the City of Madison Affirmative Action Division by the time and date established for receipt of bids. A copy of the Targeted Business Certification Application is available by contacting the Contract Compliance Officer at the address and telephone indicated in Section 2.2 or you may access the Targeted Business Certification Application online at www.cityofmadison.com/dcr/aaTBDir.cfm. Submittal of the Targeted Business Certification Application by the time specified does not guarantee that the applicant will be certified as a SBE eligible to be utilized towards meeting the SBE goal for this project.

2.4 Small Business Enterprise Compliance Report

2.4.1 Good Faith Efforts

Bidders shall take all necessary affirmative steps to assure that SBEs are utilized when possible and that the established SBE goal for this project is achieved. A contractor who self performs a portion of the work, and is pre-qualified to perform that category of work, may subcontract that portion of the work, but shall not be required to do so. When a bidder is unable to achieve the established SBE goal, the bidder must demonstrate that a good faith effort to do so was made. Such a good faith effort should include the following:

2.4.1.1 Attendance at the pre-bid meeting.
2.4.1.2 Using the City of Madison's directory of certified SBEs to identify SBEs from which to solicit bids.
2.4.1.3 Assuring that SBEs are solicited whenever they are potential sources.
2.4.1.4 Referring prospective SBEs to the City of Madison Affirmative Action Division for certification.
2.4.1.5 Dividing total project requirements into smaller tasks and/or quantities, where economically feasible, to permit maximum feasible SBE participation.
2.4.1.6 Establishing delivery schedules, where requirements permit, which will encourage participation by SBEs.
2.4.1.7 Providing SBEs with specific information regarding the work to be performed.
2.4.1.8 Contacting SBEs in advance of the deadline to allow such businesses sufficient time to prepare a bid.
2.4.1.9 Utilizing the bid of a qualified and competent SBE when the bid of such a business is deemed reasonable (i.e. 5% above the lowest bidder), although not necessarily low.
2.4.1.10 Contacting SBEs which submit a bid, to inquire about the details of the bid and confirm that the scope of the work was interpreted as intended.

2.4.2 Reporting SBE Utilization and Good Faith Efforts

The Small Business Enterprise Compliance Report is to be submitted by the bidder with the bid: This report is due by the specified bid closing time and date. Bids submitted without a completed SBE Compliance Report as outlined below

shall be deemed non-responsible and the bidder ineligible for award of this contract.

2.4.2.1 If the Bidder meets or exceeds the goal established for SBE utilization, the Small Business Enterprise Compliance Report shall consist of the following:

2.4.2.1.1 **Cover Page,** Page C-6; and
2.4.2.1.2 **Summary Sheet,** C-7.

2.4.2.2 If the bidder does not meet the goal established for SBE utilization, the Small Business Enterprise Compliance Report shall consist of the following:

2.4.2.2.1 **Cover Page,** Page C-6;
2.4.2.2.2 **Summary Sheet,** C-7; and
2.4.2.2.3 **SBE Contact Report,** C-8 and C-9. (A separate Contact Report must be completed for each applicable SBE which is not utilized.)

2.5 Appeal Procedure

A bidder which does not achieve the established goal and is found non-responsible for failure to demonstrate a good faith effort to achieve such goal and subsequently denied eligibility for award of contract may appeal that decision to the Small Business Enterprises Appeals Committee. All appeals shall be made in writing, and shall be delivered to and received by the City Engineer no later than 4:30 PM on the third business day following the bidder's receipt of the written notification of ineligibility by the Affirmative Action Division Manager. Postmark not acceptable. The notice of appeal shall state the basis for the appeal of the decision of the Affirmative Action Division Manager. The Appeal shall take place in accordance with Madison General Ordinance 33.54.

2.6 SBE Requirements After Award of the Contract

The successful bidder shall identify SBE subcontractors, suppliers and vendors on the subcontractor list in accordance with the specifications. The Contractor shall submit a detailed explanation of any variances between the listing of SBE subcontractors, vendors and/or suppliers on the subcontractor list and the Contractor's SBE Compliance Report for SBE participation.

No change in SBE subcontractors, vendors and/or suppliers from those SBEs indicated in the SBE Compliance Report will be allowed without prior approval from the Engineer and the Affirmative Action Division. The contractor shall submit in writing to the City of Madison Affirmative Action Division a request to change any SBE citing specific reasons which necessitate such a change. The Affirmative Action Division will use a general test of reasonableness in approving or rejecting the contractor's request for change. If the request is approved, the Contractor will make every effort to utilize another SBE if available.

The City will monitor the project to ensure that the actual percentage commitment to SBE firms is carried out.

2.7 SBE Definition and Eligibility Guidelines

A Small Business Enterprise is a business concern awarded certification by the City of Madison. For the purposes of this program a Small Business Enterprise is defined as:

A. An independent business operated under a single management. The business may not be a subsidiary of any other business and the stock or ownership may not be held by any individual or any business operating in the same or a similar field. In determining whether an entity qualifies as a SBE, the City shall consider all factors relevant to being an independent business including, but not limited to, the date the business was established, adequacy of its resources for the work in which it proposes to involve itself, the degree to which financial, equipment leasing and other relationships exist with other ineligible firms in the same or similar lines of work. SBE owner(s) shall enjoy the customary incidents of ownership and shall share in the risks and profits commensurate with their enjoyment interests, as demonstrated by an examination of the substance rather than form or arrangements that may be reflected in its ownership documents.

B. A business that has averaged no more than $4.0 million in annual gross receipts over the prior three year period and the principal owner(s) do not have a personal net worth in excess of $1.32 million.

Firm and/or individuals that submit fraudulent documents/testimony may be barred from doing business with the City and/or forfeit existing contracts.

SBE certification is valid for one (1) year unless revoked.

RECONSTRUCTION OF THE MADISON WATER UTILITY OPERATIONS CENTER
110 S. PATERSON STREET
JUNE 12, 2015
CONTRACT NO. 7529

Small Business Enterprise Compliance Report

This information may be submitted electronically through Bid Express or submitted with bid in sealed envelope.

Cover Sheet

Prime Bidder Information

Company:_____

Address:_____

Telephone Number:_____ Fax Number:_____

Contact Person/Title:_____

Prime Bidder Certification

I, _____, _____ of
Name Title

_____ certify that the information
Company

contained in this SBE Compliance Report is true and correct to the best of my knowledge and belief.

_____ _____
Witness' Signature Bidder's Signature

_____
Date

RECONSTRUCTION OF THE MADISON WATER UTILITY OPERATIONS CENTER
110 S. PATERSON STREET
JUNE 12, 2015
CONTRACT NO. 7529

Small Business Enterprise Compliance Report

Summary Sheet

SBE Subcontractors Who Are NOT Suppliers

Name(s) of SBEs Utilized	Type of Work	% of Total Bid Amount
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%
		%

Subtotal SBE who are NOT suppliers: _____ %

SBE Subcontractors Who Are Suppliers

Name(s) of SBEs Utilized	Type of Work	% of Total Bid Amount
		%
		%
		%
		%
		%
		%

Subtotal Contractors who are suppliers: _____ % x 0.6 = _____ % (discounted to 60%)

Total Percentage of SBE Utilization: _____%.

RECONSTRUCTION OF THE MADISON WATER UTILITY OPERATIONS CENTER
110 S. PATERSON STREET
JUNE 12, 2015
CONTRACT NO. 7529

Small Business Enterprise Compliance Report

SBE Contact Report

Submit separate copy of this form for each SBE which you are not able to utilize towards meeting the SBE goal for this project. Attach separate sheets if necessary.

SBE Information

Company: _____

Address: _____

Telephone Number: _____

Contact Person/Title: _____

1. Outline below all efforts to solicit a bid from the above SBE. Include date, means of contact, who from your company made this contact and the result.

   _____

   _____

   _____

2. Describe the information provided to the aforementioned SBE regarding the scope of work for which he/she was to provide a bid.

   _____

   _____

   _____

   Is this the same scope of work on which the subcontractor you intend to utilize based his/her bid?

   ☐ Yes ☐ No

3. Did this SBE submit a bid? ☐ Yes ☐ No

4. Is the General Contractor pre-qualified to self-perform this category of work?

   ☐ Yes ☐ No

5. If you responded “Yes” to Question 3, please check the items below which apply and provide the requested detail. If you responded “No” to Question 3, please skip ahead to item 6 below.

☐ The SBE listed above is unavailable for work on this project for the following reasons. Provide specific detail for this conclusion.

_____

_____

☐ The SBE listed above is unqualified for work on this project. Provide specific details for this conclusion.

_____

_____

☐ The SBE listed above provided a price that was unreasonable (i.e. more than 5% above the lowest bidder). Provide specific detail for this conclusion including the SBE’s price and the price of the subcontractor you intend to utilize.

_____

_____

☐ A contract with the SBE listed above may constitute a breach of the bidder’s collective bargaining agreements. Provide specific detail for this conclusion including, but not limited to, correspondence from the SBE indicating it will not sign a project labor agreement and/or correspondence from the applicable trade union indicating a project labor agreement will not be allowed at the time of project bidding.

_____

_____

☐ Other; please specify reason(s) other than listed above which made it impossible for you to utilize this SBE on this project.

_____

_____

6. Describe any other good faith efforts:

_____

_____

SECTION D: SPECIAL PROVISIONS

RECONSTRUCTION OF THE MADISON WATER UTILITY OPERATIONS CENTER
110 S. PATERSON STREET
JUNE 12, 2015
CONTRACT NO. 7529

It is the intent of these Special Provisions to set forth the final contractual intent as to the matter involved and shall prevail over the Standard Specifications and plans whenever in conflict therewith. In order that comparisons between the Special Provisions can be readily made, the numbering system for the Special Provisions is equivalent to that of the Specifications.

Whenever in these Specifications the term "Standard Specifications" appears, it shall be taken to refer to the City of Madison Standard Specifications for Public Works Construction and Supplements thereto.

SECTION 102.10: PREVAILING WAGE

For this project, payment of prevailing wages (white sheet) shall be required unless the box indicating prevailing wages are not required is checked below.

☐ Prevailing wages shall not be required when this box is checked.

If prevailing wages (white sheets) are required, the wages and benefits paid on the contract shall not be less than those specified in the Prevailing Wage Determination included with these contract documents for the following types of work:

☒ Building or Heavy Construction
☐ Sewer, Water, or Tunnel Construction
☐ Local Street or Miscellaneous Paving Construction
☐ Residential or Agricultural Construction

When multiple boxes are checked, worker's wages may vary according to the type and area of work performed. It is the responsibility of the Contractor to determine and apply the appropriate wage rate for the specific work assigned.

SECTION 102.12: BEST VALUE CONTRACTING

This Contract shall be considered a Best Value Contract if the Contractor's bid is equal to or greater than $55,500 for a single trade contract; or equal to or greater than $271,500 for a multi-trade contract pursuant to MGO 33.07(7).

Engineering Special Provisions

Reconstruction of the Madison Water Utility Operations Center

110 S. Paterson Street

Mead & Hunt, Inc.
3235300-131021.03

Contract No. 7529

Prepared for:

Madison Water Utility
Madison, Wisconsin

Prepared by:

Mead & Hunt

June 12, 2015

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SECTION 000110 - TABLE OF CONTENTS

VOLUME 1 of 2

END OF SECTION 000110

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DOCUMENT 000115 - LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.1 LIST OF DRAWINGS

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled Paterson Street Operations Center, dated June 12, 2015 as modified by subsequent Addenda and Contract modifications.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

1. G-001 COVER SHEET
2. G-002 CODE ANALYSIS FIRST FLOOR PLAN AND SCHEDULES
3. G-003 CODE ANALYSIS SECOND AND BASEMENT PLANS
4. G-004 SITE PHASING & ACCESS PLAN
5. G-005 SITE PHASING & ACCESS PLAN
6. G-101 PHASE 1 & 2 - PLANS
7. G-102 PHASE 2 & 3 - PLANS
8. G-103 PHASE 3 - PLANS
9. G-104 TEMPORARY LAYOUT PLANS
10. C-021 EXISTING SITE PLAN
11. C-041 SITE REMOVALS PLAN
12. C-101 SITE IMPROVEMENTS PLAN
13. C-121 EROSION CONTROL PLAN
14. C-131 GRADING PLAN
15. C-141 SITE UTILITY PLAN
16. C-501 SITE IMPROVEMENT DETAILS
17. C-502 SITE IMPROVEMENT DETAILS
18. C-503 SITE IMPROVEMENT DETAILS
19. C-504 SITE IMPROVEMENT DETAILS
20. C-505 STORM WATER TREATMENT DETAILS
21. L-200 LANDSCAPE PLAN
22. L-300 SITE DETAILS
23. L-301 SITE DETAILS
24. S-001 GENERAL INFORMATION
25. S-002 GENERAL NOTES
26. S-004 GENERAL FOUNDATION DETAILS
27. S-005 GENERAL STEEL FRAMING DETAILS
28. S-006 GENERAL ROOF DECK DETAILS
29. S-007 GENERAL MASONRY DETAILS
30. S-101 FOUNDATION PLAN
31. S-102 EXISTING BUILDING FOUNDATION PLAN
32. S-103 SECOND FLOOR FRAMING PLAN
33. S-104 EXISTING BUILDING SECOND FLOOR FRAMING PLAN
34. S-110 LOW ROOF FRAMING PLAN
35. S-111 HIGH ROOF FRAMING PLAN
36. S-112 EXISTING BUILDING ROOF FRAMING PLAN

37. S-501 FOUNDATION DETAILS
38. S-502 FOUNDATION DETAILS
39. S-521 PRECAST DETAILS
40. S-531 ROOF DECK DETAILS
41. S-601 SCHEDULES
42. S-602 STEEL COLUMN SCHEDULE
43. S-608 MASONRY SCHEDULES
44. A-001 NOTES & SYMBOLS
45. AD100 BASEMENT FLOOR DEMOLITION PLAN
46. AD101 FIRST FLOOR DEMOLITION PLAN
47. AD102 SECOND FLOOR DEMOLITION PLAN
48. AD103 ROOF DEMOLITION PLAN
49. A-100 BASEMENT FLOOR PLAN
50. A-101 FIRST FLOOR PLAN
51. A-102 SECOND FLOOR PLAN
52. A-103 ROOF PLAN
53. A-141 PARTITION TYPES
54. A-201 EXTERIOR ELEVATIONS
55. A-301 BUILDING SECTIONS
56. A-302 BUILDING SECTIONS
57. A-311 WALL SECTIONS
58. A-312 WALL SECTIONS
59. A-313 WALL SECTIONS
60. A-401 ENLARGED INTERIOR PLANS
61. A-402 ENLARGED INTERIOR PLANS
62. A-403 ENLARGED STAIR PLANS AND SECTIONS
63. A-404 ENLARGED STAIR PLANS AND SECTIONS
64. A-405 ENLARGED STAIR PLANS AND SECTIONS
65. A-501 EXTERIOR PLAN DETAILS
66. A-502 EXTERIOR SECTION DETAILS
67. A-503 EXTERIOR SECTION DETAILS
68. A-504 ENLARGED FLASHING DETAILS
69. A-505 ROOF DETAILS
70. A-601 ARCHITECTURAL SCHEDULES
71. A-602 DOOR SCHEDULE
72. A-603 WINDOW TYPES
73. A-604 WINDOW TYPES
74. A-621 DOOR DETAILS
75. A-623 WINDOW DETAILS
76. A-721 FIRST FLOOR CEILING PLAN
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79. A-802 EQUIPMENT AND FURNITURE LAYOUT PLANS (FOR REFERENCE ONLY)
80. F-001 FIRE PROTECTION NOTES & SYMBOLS
81. F-100 BASEMENT FLOOR PLAN - FIRE PROTECTION
82. F-101 FIRST FLOOR PLAN - FRIE PROTECTION
83. F-102 SECOND FLOOR PLAN - FIRE PROTECTION
84. P-001 PLUMBING NOTES & SYMBOLS
85. PD-100 PLUMBING DEMOLITION - DWV
86. PD-131 PLUMBING DEMOLITION - SUPPLY

87. P-100 BELOW GRADE PLAN - DWV
88. P-101 FIRST FLOOR PLAN - DWV
89. P-102 SECOND FLOOR PLAN - DWV
90. P-103 ROOF FLOOR PLAN - STORM DRAIN
91. P-131 FIRST FLOOR PLAN - SUPPLY
92. P-132 SECOND FLOOR PLAN - SUPPLY
93. P-501 PLUMBING DETAILS
94. P-502 PLUMBING DETAILS
95. P-601 PLUMBING SCHEDULES
96. P-901 PLUMBING ISOMETRIC - DW
97. P-902 PLUMBING ISOMETRIC - SUPPLY
98. M-001 MECHANICAL NOTES & SYMBOLS
99. MD100 MECHANICAL DEMOLITION PLAN - BASEMENT FLOOR PLAN
100. MD101 MECHANICAL DEMOLITION PLAN - FIRST FLOOR
101. MD102 MECHANICAL DEMOLITION PLAN - SECOND FLOOR
102. MD103 MECHANICAL DEMOLITION PLAN - ROOF PLAN
103. M-100 BASEMENT HVAC PLAN
104. M-101 FIRST FLOOR PLAN - HVAC
105. M-102 SECOND FLOOR- HVAC PLAN
106. M-103 ROOF - HVAC AND PIPING PLAN
107. M-130 BASEMENT - PIPING PLAN
108. M-131 FIRST FLOOR - MECHANICAL PIPING PLAN
109. M-132 SECOND FLOOR - MECHANICAL PIPING PLAN
110. M-501 HVAC DETAILS
111. M-502 HVAC DETAILS
112. M-531 MECHANICAL DETAILS
113. M-601 MECHANICAL SCHEDULES
114. M-602 MECHANICAL SCHEDULES
115. M-603 MECHANICAL SCHEDULES
116. M-604 MECHANICAL SCHEDULES
117. M-701 MECHANICAL SCHEMATICS
118. E-001 NOTES, SYMBOLS & ABBREVIATIONS
119. ED011 ELECTRICAL DEMOLITION SITE PLAN
120. ED100 BASEMENT FLOOR PLAN - DEMOLITION
121. ED101 FIRST FLOOR PLAN - DEMOLITION
122. ED102 SECOND FLOOR PLAN - DEMOLITION
123. E-011 ELECTRICAL SITE PLAN
124. E-100 BASEMENT FLOOR PLAN - LIGHTING
125. E-101 FIRST FLOOR PLAN - LIGHTING
126. E-102 SECOND FLOOR PLAN - LIGHTING
127. E-130 BASEMENT FLOOR PLAN - POWER
128. E-131 FIRST FLOOR PLAN - POWER
129. E-132 SECOND FLOOR PLAN - POWER
130. E-133 ROOF PLAN - POWER
131. E-160 BASEMENT FLOOR PLAN - FIRE ALARM
132. E-161 FIRST FLOOR PLAN - FIRE ALARM
133. E-162 SECOND FLOOR PLAN - FIRE ALARM
134. E-401 ENLARGED PLANS
135. E-501 DETAILS
136. E-502 DETAILS
137. E-601 SCHEDULES

138. E-602 SCHEDULES
139. E-603 SCHEDULES
140. E-604 SCHEDULES
141. E-701 ONE-LINE DIAGRAM
142. T-001 NOTES, SYMBOLS & ABBREVIATIONS
143. TD100 BASEMENT FLOOR PLAN - DEMOLITION
144. TD101 FIRST FLOOR PLAN - DEMOLITION
145. TD102 SECOND FLOOR PLAN - DEMOLITION
146. T-100 BASEMENT FLOOR PLAN - TECHNOLOGY
147. T-101 FIRST FLOOR PLAN - TECHNOLOGY
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149. T-401 ENLARGED PLANS - TECHNOLOGY
150. T-501 TECHNOLOGY DETAILS
151. T-502 TECHNOLOGY DETAILS
152. T-503 TECHNOLOGY DETAILS
153. T-601 TECHNOLOGY SCHEDULES
154. T-701 TECHNOLOGY ONE-LINE DIAGRAMS

END OF DOCUMENT 000115

DOCUMENT 003126 - EXISTING HAZARDOUS MATERIAL INFORMATION

PART 1 - GENERAL

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. An existing hazardous materials assessment report for Project, prepared by SCS, dated TBD, is available for viewing as appended to this Document.

C. An existing Asbestos Inspection Report for Project, prepared by KPH Environmental, dated February 2015, is available for viewing as appended to this Document.

D. Related Requirements:

1. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

END OF DOCUMENT 003126

ASBESTOS INSPECTION REPORT
Job Site:

Operations Center
110 South Paterson Street
Madison, Wisconsin

For:

Madison Water Utility
Attn: Dan Rodefeld
110 S. Paterson St.
Madison, WI 53703

KPH Project No.: 15-400-003

Dean Jacobsen
Asbestos Inspector No. 14370

Prepared by:

KPH Environmental
1237 West Bruce Street
Milwaukee, Wisconsin 53204

February 2015

TABLE OF CONTENTS

I. INTRODUCTION

KPH Environmental Corp., (KPH) was retained by the Madison Water Utility to conduct an inspection for possible asbestos containing materials at 110 South Paterson Street, Madison, Wisconsin. The one (1) story (northern) section of the building containing offices and service bays is scheduled for demolition. The two (2) story (southern) section with basement containing the lunch room, lockers rooms, meter room, and mechanical and storage areas is scheduled for renovation.

Dan Rodefeld, of the Madison Water Utility, authorized KPH to conduct a building inspection and to analyze samples collected during the inspection. The inspection of the operations center located at 110 South Paterson Street, Madison, Wisconsin, was conducted on January 20-21, 2015. The inspection was conducted by Dean Jacobsen, Wisconsin Asbestos Inspector License No. AII – 14370. Additional information on the inspection and results are contained in the following sections.

II. BUILDING SURVEY

A. Methods

This limited asbestos inspection included a visual determination as to the extent of visible and accessible suspect materials in the building, sampling and documentation of these suspect materials, and quantification of observable and accessible positive materials existing within the spaces.

Bulk sampling involves inspecting all or part of a building (depending on the project scope) and identifying suspect asbestos containing materials. According to the USEPA, this includes all materials except wood, metal, and glass. After suspect materials are identified, the inspector divides the building into homogeneous areas. Homogeneous areas contain materials that are alike in color, composition, age of installation, and any other aspect. If any differences are identified during the inspection, a separate homogeneous area is established. The inspector then uses USEPA sampling protocols to collect bulk samples based upon the type of material and quantity of material in the homogeneous area. Bulk samples are placed into resealable containers and sent to a laboratory certified under the National Voluntary Laboratory Accreditation program (NVLAP) for analysis. Destructive sampling was not conducted where it would have adversely impacted suspect asbestos containing materials, such as plaster, to avoid building contamination.

The results of the survey integrated with the Polarized Light Microscopy with Dispersion Staining (PLM/DS) analysis of bulk samples taken are outlined in this document.

B. List of Suspect Asbestos Containing Materials

The following types of suspect materials were inspected to determine if asbestos containing materials were present within the building as required by US EPA NESHAP regulation 40 CFR 61 Subpart M and NR 447 of the Wisconsin Administrative Code:

- Pipe insulation fittings
- Clay pipe
- Caulk
- Window glazing compound
- Gaskets
- Brick/mortar
- Floor tile/mastic
- Vinyl wallbase/mastic
- Ceiling tile
- Ceramic tile
- Concrete block
- Duct mastic
- Drywall/joint compound
- Fiberboard
- Plaster
- Carpet mastic
- Wall mastic
- Joint compound
- Texture
- Roofing

A listing of specific homogeneous materials and homogeneous material codes are in the Samples and Results section following the results table.

III. THE LABORATORY

Samples were analyzed at Amerisci of Midlothian, Virginia, a National Voluntary Laboratory Accreditation Program lab, for total asbestos content by volume using EPA Method 600/M4/82/020, 600/R-93/116. Analysis is performed by using the bulk samples for visual observation and slide preparation(s) for microscopical examination and identification. The slides are analyzed for asbestos (chrysotile, amosite, crodcidolite, anthophyllite, and actinolite/ tremolite), fibrous non asbestos constituents (mineral wool, paper, etc.), and nonfibrous constituents. Asbestos is identified by refractive indices (obtained by using dispersion staining), morphology, color, pleochroism, birefringence, extinction characteristics, and signs of elongation. The same characteristics are used to identify the non asbestos constituents.

The microscopist visually estimates relative amounts of each constituent using a stereoscope if necessary. The test results are based on a visual determination of relative volume of the bulk sample components. The results are valid only for the item tested. Where the first sample of a homogeneous material contained more than 1% asbestos, the subsequent samples of that material were not analyzed. A point count analysis is performed for samples where the polarized light microscopy result is close to 1%. The point count is a more accurate fiber counting method and takes precedence over polarized light microscopy result.

Current regulations state asbestos containing materials (ACM) means material containing more than 1% asbestos as determined using the method specified in Appendix E, Subpart E, 40 CFR Part 763 Section I, Polarized Light Microscopy. Bold values indicate that the material contains more than 1% asbestos.

Refer to 29 CFR 1926.1101 (Construction) for specific OSHA asbestos safety requirements.

IV. FINDINGS AND OBSERVATIONS

The following are the laboratory results:

Sample #	Location and Description	Results	Homogeneous Code
1A-110	Basement – east area – on south wall under panel – tan mastic	Negative	MWMt
1B-110	Basement – west area – on south wall under panel – tan mastic	Negative	MWMt
1C-110	Basement – center area – on south wall under panel – tan mastic	Negative	MWMt
2A-110a	Basement – east area - <5” diameter pipe insulation fitting wrap	Negative	TF5
2A-110b	Basement – east area - <5” diameter pipe insulation fitting	Negative	TF5
2B-110a	1st floor – west chemical room - <5” diameter pipe insulation fitting wrap	Negative	TF5
2B-110b	1st floor – west chemical room - <5” diameter pipe insulation fitting	Negative	TF5
2C-110a	1st floor – men’s locker room - <5” diameter pipe insulation fitting wrap	Negative	TF5
2C-110b	1st floor – men’s locker room - <5” diameter pipe insulation fitting	Negative	TF5
3A-110	Basement – north room – in drain channel – clay pipe	Negative	MCP
4A-110	Basement – north room – on north wall – plaster	Negative	SPl
4B-110	Basement – north room – on south wall – plaster	Negative	SPl
4C-110	Basement – north room – on ceiling – plaster	Negative	SPl
5A-110	Basement – on windows – tan caulk	Trace <1% Chrysotile	MCLKt
5A-110	POINT COUNT RESULT	Trace <0.25% Chrysotile	MCLKt
6A-110	Basement – east area – on window – glazing compound	Negative	MPG
6B-110	1st floor – west maintenance area – on window – glazing compound	Trace <1% Chrysotile	MPG

Sample #	Location and Description	Results	Homogeneous Code
6B-110	POINT COUNT RESULT	Trace 0.3% Chrysotile	MPG
6C-110	1st floor – service bays – on window – glazing compound	Negative	MPG
7A-110	Basement – center area – on gas pipes at space heater – cream caulk	Trace <1% Chrysotile	MCLKc
7A-110	POINT COUNT RESULT	Trace <0.25% Chrysotile	MCLKc
8A-110	Basement – center area – on shelves – Ankorite gasket	Negative	TGK
9A-110	Basement – center area – on shelves – Thermoseal gasket	Negative	TGK2
10A-110	Basement – east area – on stair doors – gray caulk	Negative	MCLKy
10B-110	1st floor – west maintenance room – on exterior door – gray caulk	Negative	MCLKy
10C-110	1st floor – men's locker room – on doors – gray caulk	Negative	MCLKy
11A-110	1st floor – west maintenance room – west wall – brick/mortar	Negative	MBR
11B-110	1st floor – women's locker room – south wall – brick/mortar	Negative	MBR
11C-110a	2nd floor – exterior wall – brick	Negative	MBR
11C-110b	2nd floor – exterior wall – mortar	Negative	MBR
12A-110a	1st floor – south corridor – at closet – 12" white and gray floor tile	Negative	MF12wy
12A-110b	1st floor – south corridor – at closet – under white and gray floor tile – tan mastic	Negative	MF12wy
12B-110a	1st floor – lunch room – 12" white and gray floor tile	Negative	MF12wy
12B-110b	**1st floor – lunch room – under white and gray floor tile – black mastic**	**Positive 5% Chrysotile**	**MF12wy**
12C-110a	1st floor – stair to south offices – 12" white and gray floor tile	Negative	MF12wy
12C-110b	1st floor – stair to south offices – under white and gray floor tile – tan mastic	Negative	MF12wy
13A-110a	1st floor – south corridor – 4" blue vinyl wallbase	Negative	MV4b
13A-110b	1st floor – south corridor – under blue vinyl wallbase – beige mastic	Negative	MV4b
14A-110a	1st floor – lunch room – 4" gray vinyl wallbase	Negative	MV4y
14A-110b	1st floor – lunch room – under gray vinyl wallbase – beige mastic	Negative	MV4y
15A-110	1st floor – lunch room – north side – 2' x 4' rough texture ceiling tile	Negative	MSCT24R
15B-110	1st floor – lunch room – center – 2' x 4' rough texture ceiling tile	Negative	MSCT24R
15C-110	2nd floor – meter room – 2' x 4' rough texture ceiling tile	Negative	MSCT24R
16A-110	1st floor – men's locker room – 2' x 4' smooth ceiling tile	Negative	MSCT24S
16B-110	1st floor – women's locker room – 2' x 4' smooth ceiling tile	Negative	MSCT24S
16C-110	1st floor – men's locker room – 2' x 4' smooth ceiling tile	Negative	MSCT24S
17A-110a	1st floor – men's locker room floor – red ceramic tile	Negative	MCTMr
17A-110b	1st floor – men's locker room floor – under ceramic tile – brown mastic	Negative	MCTMr
17A-110c	1st floor – men's locker room floor – grout	Negative	MCTMr
17B-110a	1st floor – women's locker room floor – red ceramic tile	Negative	MCTMr

Sample #	Location and Description	Results	Homogeneous Code
17B-110b	1st floor – women's locker room floor – under ceramic tile – brown mastic	Negative	MCTMr
17B-110c	1st floor – women's locker room floor – grout	Negative	MCTMr
17C-110a	1st floor – mud room floor – red ceramic tile	Negative	MCTMr
17C-110b	1st floor – mud room floor – under ceramic tile – brown mastic	Negative	MCTMr
17C-110c	1st floor – mud room floor – grout	Negative	MCTMr
18A-110	1st floor – locker rooms – on walls – concrete block/mortar	Negative	MCBL
19A-110	1st floor – stair to south offices – 1' x 1' ceiling tile	Negative	MSCT11
19B-110	1st floor – south offices – 1' x 1' ceiling tile	Negative	MSCT11
19C-110	1st floor – north offices – 1' x 1' ceiling tile	Negative	MSCT11
20A-110a	1st floor – stair to south offices – 4" brown vinyl wallbase	Negative	MV4n
20A-110b	1st floor – stair to south offices – under brown vinyl wallbase – yellow mastic	Negative	MV4n
21A-110a	1st floor – south offices lobby – under carpet – yellow mastic	Negative	MCM
21A-110b	**1st floor – south offices lobby – under carpet – 9" tan floor tile**	**Positive 3% Chrysotile**	**MF9t**
21A-110c	**1st floor – south offices lobby – under carpet – under tan floor tile – black mastic**	**Positive 10% Chrysotile**	**MF9t**
21B-110a	Not Analyzed Due to Prior Positive Sample	NA	MF9t
21B-110b	Not Analyzed Due to Prior Positive Sample	NA	MF9t
21C-110a	Not Analyzed Due to Prior Positive Sample	NA	MF9t
21C-110b	Not Analyzed Due to Prior Positive Sample	NA	MF9t
22A-110a	1st floor – south offices lobby – at west counter – 4" brown and gray vinyl wallbase	Negative	MV4ny
22A-110b	1st floor – south offices lobby – at west counter – under brown and gray vinyl wallbase – beige mastic	Negative	MV4ny
23A-110	1st floor – south offices – on duct above ceiling tile – under fiberglass – yellow mastic	Negative	MDM
24A-110a	1st floor – northeast office – south wall – joint compound	Negative	MDW
24A-110b	1st floor – northeast office – south wall – drywall	Negative	MDW
24B-110a	1st floor – service bay – closet wall – joint compound	Negative	MDW
24B-110b	1st floor – service bay – closet wall – drywall	Negative	MDW
24C-110a	2nd floor – meter room – south wall – joint compound	Negative	MDW
24C-110b	2nd floor – meter room – south wall – drywall	Negative	MDW
25A-110	1st floor – south offices – on east windows – white caulk	Trace <1% Chrysotile	MCLKw
25A-110	POINT COUNT RESULT	Trace <0.25% Chrysotile	MCLKw
26A-110a	1st floor – men's and women's restrooms – wallbase – beige ceramic tile	Negative	MCTMe
26A-110b	1st floor – men's and women's restrooms – wallbase – under ceramic tile – white mastic	Negative	MCTMe
27A-110a	1st floor – men's and women's restrooms floor – tan ceramic tile	Negative	MCTMt
27A-110b	1st floor – men's and women's restrooms floor – under ceramic tile – yellow mastic	Negative	MCTMt
28A-110	1st floor – service bay office – 12" tan floor tile	Negative	MF12t
29A-110	1st floor – service bay office ceiling – fiberboard	Negative	MFB

Sample #	Location and Description	Results	Homogeneous Code
30A-110a	1st floor – north offices ceiling – west side – plaster #2 skim coat	Negative	SPl2
30A-110b	1st floor – north offices ceiling – west side – plaster #2 base coat	Negative	SPl2
30B-110a	1st floor – north offices ceiling – east side – plaster #2 skim coat	Negative	SPl2
30B-110b	1st floor – north offices ceiling – east side – plaster #2 base coat	Negative	SPl2
30C-110a	1st floor – service bay ceiling – north side – plaster #2 skim coat	Negative	SPl2
30C-110b	1st floor – service bay ceiling – north side – plaster #2 base coat	Negative	SPl2
30D-110	1st floor – service bay ceiling – south side – plaster #2	Negative	SPl2
30E-110	1st floor – chemical storage room ceiling – plaster #2	Negative	SPl2
31A-110a	1st floor – north office – west side under carpet – tan mastic	Negative	MCM2
31A-110b	**1st floor – north office – west side under carpet – 12" beige floor tile**	**Positive 2% Chrysotile**	**MF12e**
31A-110c	**1st floor – north office – west side under beige floor tile – black mastic**	**Positive 5% Chrysotile**	**MF12e**
31A-110a	1st floor – north office – north side under carpet – tan mastic	Negative	MCM2
31A-110b	Not Analyzed Due to Prior Positive Sample	NA	MF12e
31A-110c	Not Analyzed Due to Prior Positive Sample	NA	MF12e
31C-110a	Not Analyzed Due to Prior Positive Sample	NA	MF12e
31C-110b	Not Analyzed Due to Prior Positive Sample	NA	MF12e
32A-110	1st floor – north offices – southwest room – under carpet – tan/yellow mastic	Negative	MCM3
33A-110	1st floor – north offices – on windows – glazing compound #2	Negative	MPG2
34A-110	1st floor – north offices – east wall on Styrofoam – tan wall mastic #2	Negative	MWMt2
35A-110	1st floor – conference room – on wood wall seams – joint compound	Negative	MJC
36A-110a	2nd floor – meter room – west side – 12" beige and gray floor tile	Negative	MF12ey
36A-110b	**2nd floor – meter room – west side – under beige and gray floor tile – black mastic**	**Positive 2% Chrysotile**	**MF12ey**
36B-110a	2nd floor – meter room – east side – 12" beige and gray floor tile	Negative	MF12ey
36B-110b	**2nd floor – meter room – east side – under beige and gray floor tile – black mastic**	**Positive 2% Chrysotile**	**MF12ey**
36C-110a	2nd floor – meter room – north side – 12" beige and gray floor tile	Negative	MF12ey
36C-110b	**2nd floor – meter room – north side – under beige and gray floor tile – black mastic**	**Positive 4% Chrysotile**	**MF12ey**
37A-110a	2nd floor – southeast office – 12" beige and tan floor tile	Negative	MF12et
37A-110b	**2nd floor – southeast office – under beige and tan floor tile – black mastic**	**Positive 5% Chrysotile**	**MF12et**
38A-110	2nd floor – southeast office – 2' x 4' pinholed and grooved ceiling tile	Negative	MSCT24PG

Sample #	Location and Description	Results	Homogeneous Code
39A-110	**Exterior – on 2nd floor windows – white caulk #2**	**Positive 3% Chrysotile**	**MCLKw2**
40A-110a	**Roof – south side parapet – on ceramic tile – black flashing**	**Positive 8% Chrysotile**	**MRF**
40A-110b	Roof – south side parapet – brown ceramic tile	Negative	MCTMn
41A-110	2nd floor – meter room – center – gray linoleum	Negative	MFLy
42A-110	2nd floor – electric room – north side ceiling – texture	Negative	STX
42B-110	2nd floor – electric room – center ceiling – texture	Negative	STX
42C-110	2nd floor – electric room – south side ceiling – texture	Negative	STX
43A-110	Exterior – on garage door bumper edges and west windows – red caulk	Negative	MCLKr
44A-110	Exterior – on west doors – green caulk	Negative	MCLKg
45A-110a	Roof – over 2nd floor – built up roofing	Negative	MRM
45A-110b	Roof – over 2nd floor – on built up roofing – tar	Negative	MRM
46A-110a	Roof – over 1st floor – center section – built up roofing #2	Negative	MRM2
46A-110b	Roof – over 1st floor – center section – on built up roofing – tar	Negative	MRM2
47A-110	Roof – over 1st floor – north section – built up roofing #3b	Negative	MRM3
48A-110	Roof – over 1st floor – on parapet – gray caulk #2	Negative	MCLKy2

Homogeneous Material Codes

MWMt	Tan Wall Mastic
MWMt2	Tan Wall Mastic #2
MCP	Clay Pipe
MCLKt	Tan Caulk
MCLKc	Cream Caulk
MCLKy	Gray Caulk
MCLKy2	Gray Caulk #2
MCLKwWhite Caulk	
MCLKw2	White Caulk #2
MCLKr	Red Caulk
MCLKg	Green Caulk
MPG	Glazing Compound Metal Windows
MPG2	Glazing Compound Wood Windows
MBR	Brick/mortar
MF12wy	12” White & Gray Floor Tile
MF12t	12” Tan Floor Tile
MF12e	12” Beige Floor Tile
MF12ey	12” Beige & Gray Floor Tile
MF12et	12” Beige & Tan Floor Tile
MF9t	9” Tan Floor Tile
MV4b	4” Blue Vinyl Wallbase
MV4y	4” Gray Vinyl Wallbase
MV4n	4” Brown Vinyl Wallbase
MV4ny	4” Brown & Gray Vinyl Wallbase
MSCT24R	2’ x 4’ Rough Texture Ceiling Tile
MSCT24S	2’ x 4’ Smooth Ceiling Tile
MSCT24PG	2’ x 4’ Smooth Ceiling Tile
MSCT11	1’ x 1’ Ceiling Tile

Homogeneous Material Codes

MCBL	Concrete Block/Mortar
MCTMr	Red Ceramic Tile
MCTMe	Beige Ceramic Tile
MCTMt	Tan Ceramic Tile
MCTMn	Brown Ceramic Tile
MDM	Duct Mastic
MBR	Brick/Mortar
MDW	Drywall/Joint Compound
MFB	Fiberboard
MJC	Joint Compound
MCM	Carpet Mastic
MCM2	Carpet Mastic #2
MCM3	Carpet Mastic #3
MFLy	Gray Linoleum
MRM	Built up Roofing South End
MRM2	Built up Roofing Center
MRM3	Built up Roofing North End
MRF	Flashing
TGK	Ankorite Gasket
TGK2	Thermoseal Gasket
TF5	<5" Diameter Pipe Insulation Fitting
SPl	Plaster
SPl2	Plaster #2
STX	Texture

Note#1: Federal, state, and local inspection and sampling guidelines were followed.

Note#2: Random sampling methods were used in general accordance with the U. S. Environmental Protection Agency National Emission Standards for Hazardous Air Pollutants guidelines (40 CFR 61 Subpart M).

Note#3: Any materials that are discovered during demolition or renovation that are not listed above are to be assumed to be asbestos containing.

V. SUMMARY OF RESULTS

Seven (7) of the materials sampled contain greater than 1% asbestos and are listed below.

Material	Homogeneous Code	Location	Approximate Quantity	Recommended Action
Black Mastic Under 12" White & Gray Floor Tile	MF12wy	1st Floor Lunch Room	900 Sq. Ft.	Abatement Prior to Renovation. Category I Non Friable
Black Mastic Under 12" Beige & Gray Floor Tile	MF12ey	2nd Floor Meter Room	3,800 Sq. Ft.	Abatement Prior to Renovation. Category I Non Friable
Black Mastic Under 12" Beige & Tan Floor Tile	MF12et	2nd Floor Southeast Office	150 Sq. Ft.	Abatement Prior to Renovation. Category I Non Friable

Material	Homogeneous Code	Location	Approximate Quantity	Recommended Action
9" Tan Floor Tile & Black Mastic	MF9t	1st Floor South Offices Under Carpet	1,700 Sq. Ft.	Abatement Prior to Demolition if Underlying Concrete Will be Recycled. Category I Non Friable
12" Beige Floor Tile & Black Mastic	MF12e	1st Floor North Office Under Carpet	1,700 Sq. Ft.	Abatement Prior to Demolition if Underlying Concrete Will be Recycled. Category I Non Friable
White Caulk #2	MCLKw2	Exterior – Metal Windows & Doors – 1st Floor East & South Sides, 2nd Floor	20 Windows & 3 Doors	Abatement Prior to Demolition. Category II Non Friable
Black Flashing	MRF	Ceramic Tile Parapet – Roof Over 2nd Floor	350 Sq. Ft.	Abatement Prior to Renovation if Roofing Will be Replaced. Category I Non Friable

Any category I non-friable materials may remain on the building during demolition only if the demolition debris will be disposed at a solid waste or construction/demolition landfill. They must be abated by a Wisconsin certified asbestos abatement contractor prior to renovation, or if any underlying materials will be recycled during demolition.

Any friable and category II non-friable materials must be removed by a Wisconsin certified asbestos abatement contractor prior to building demolition or renovation.

The following materials are assumed ACMs. These materials were not accessible, or were not sampled to avoid building or equipment damage.

Assumed Asbestos Containing Material:

Floor Level	Location	Description	Approximate Quantity
Basement/1st Floor/2nd Floor	Boiler Room/Mechanical Rooms/Meter Room	Transite Panels in Electrical Boxes	20 Boxes
All	Stairwells	Metal Fire Doors	4 Doors
1st Floor	Men's & Women's Locker Rooms	Mastic Under Mirrors	2 Mirrors
1st Floor	Boiler Room	Interior Boiler Insulation	120 Sq. Ft.

These materials are friable or category II non-friable materials. KPH recommends inspection and sampling when accessible prior to building renovation and demolition.

The following materials sampled were found to contain <1% asbestos but more than zero asbestos.

Material	Homogeneous Code	Location	Approximate Quantity	Recommended Action
Tan Caulk	MCLKt	Basement Windows	15 Windows	Abatement Prior to Renovation.
Window Glazing Compound	MPG	Basement/1st Floor/2nd Floor Metal Windows	40 Windows	Abatement Prior to Renovation. May Remain on Portions of Building to be Demolished.
Cream Caulk	MCLKc	3 Basement & 1 1st Floor Space Heaters – On Gas Pipe Threads	8 Ln. Ft. of Pipe. May be additional caulk on threaded gas supply pipe within building walls or ceilings	Abatement Prior to Renovation.
White Caulk	MCLKw	1st Floor South Offices Windows	4 Windows	May Remain on Building During Demolition.

The Occupational Safety & Health Administration (OSHA) asbestos regulation in 29 CFR 1926.1101 requires personal exposure monitoring, debris cleanup with wet methods and HEPA vacuums, and use of leak tight containers for waste when disturbing or removing materials containing 1% or less asbestos. Because of these requirements, KPH recommends that all of the three (3) materials listed above be removed by a Wisconsin certified asbestos abatement contractor prior to renovation. They may remain on the portions of the building being demolished during the demolition process.

The following universal wastes were identified in the building:

Material	Location	Approximate Quantity
Roof Top Air Conditioner-CFC	Roof	3
Window Air Conditioner-CFC	Lunch Room	2
Drinking Fountains-CFC	Lunch Room, Service Bay, Meter Room	3
Refrigerators/Soda Machine-CFC	Lunch Room	2
Fire Extinguishers-CFC	All Floors	25
Thermostats-Mercury	Basement East & West Rooms/Stairwell, 1st Floor Chemical Room/Corridor/	6
Fluorescent Light Ballasts-PCB	All Floors	260
Fluorescent Light Bulbs-Mercury	All Floors	690
Exit Signs-Tritium	All Floors	18
Door Closers-PCB	All Floors	28

Universal wastes must be removed separately for proper disposal prior to building demolition or renovation.

VI. EXCLUSIONS

Locations not visible include areas within walls, between ceilings and roofs, and active electrical and mechanical equipment. No visible or accessible areas or material were excluded from this scope of work.

This report represents the condition of the building and its visible/accessible suspect asbestos containing materials at the date and the times of the onsite inspection. Hidden materials or those materials that could be present at the point of inspection, over and above those stated in the inspection report, are the responsibility of the building owner and the renovation contractor.

VII. LIMITATIONS

The care and skill given to our procedures insures the most reliable test results possible. KPH utilized Amerisci Richmond for our Polarized Light Microscopy, as specified by the client. The findings and conclusions of KPH represent our professional opinions extrapolated from limited data. Significant limited data is gathered during the course of the preliminary asbestos specific site assessment. No other warranty is expressed or implied. Prior to any abatement or renovation activities, it is recommended that KPH be provided the opportunity to review such plans in order that the inspection and assessments contained herein are properly interpreted and implemented.

This report and the information contained herein are prepared for the sole and exclusive use and possession of the Madison Water Utility. No other person or entity may rely on this report or any information contained herein. Any dissemination of the Report or any information contained herein is strictly prohibited without prior written authorization from KPH Environmental Corp.

DOCUMENT 003132 - GEOTECHNICAL DATA

PART 1 - GENERAL

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. Soil-boring data for Project, obtained by CGC, Inc., dated December 5, 2005, is available for viewing as appended to this Document.

C. A geotechnical investigation report for Project, prepared by CGC, Inc., dated December 5, 2005, is available for viewing as appended to this Document.

D. Related Requirements:

1. Document 003126 "Existing Hazardous Material Information" for hazardous materials reports that are made available to bidders.

END OF DOCUMENT 003132

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WW

CGC, Inc.

Construction • Geotechnical
Consulting Engineering/Testing

December 5, 2005
C05459

Mr. Alan Larson, P.E.
Madison Water Utility
119 E. Olin Avenue
Madison, WI 53713-1431

Re: Geotechnical Exploration Report
Paterson Street Vehicle Maintenance Facility
Madison, Wisconsin

Dear Mr. Larson:

Construction • Geotechnical Consultants, Inc. (CGC) has completed the subsurface exploration for the proposed addition to the vehicle maintenance building, as well as the future dry storage facility on the property across Paterson Street. The primary purpose of this exploration was to evaluate the subsurface conditions on the sites and to provide geotechnical recommendations regarding foundation, floor slab, below-grade wall and pavement design/construction. Two copies of this report are provided for your use, and two additional copies are being forwarded to the project architect, Mr. Chris Romney of Bray Associates (Bray) and the project structural engineer, Mr. Fred Groth of Graef Anhalt & Schloemer (GAS).

PROJECT DESCRIPTION

We understand the project will consist of demolishing the 1918 wing of the existing building at 110 S. Paterson Street and building a new addition. The new vehicle maintenance building will be approximately 11,000 sq ft in area. The building is expected to be a combination of masonry load bearing wall and steel frame. The mezzanine and office areas will be precast plank. The typical roof will be steel bar joist and metal deck. A pit for a vehicle hoist will be constructed in one of the bays. We understand the pit may extend as deep as 9 ft below the slab and will be a reinforced concrete structure.

Typical column loads for spread footings will be 60 kips (dead) and 46 kips (live load) for a total load of 106 kips. Typical wall loads will be 5 kips per lineal foot (total).

We also understand that a temporary vehicle maintenance building will be constructed in a current storage yard behind the existing Water Utility Vehicle Storage Building located across the street on the east side of Paterson Street. The building will ultimately be converted for dry storage of materials and supplies but will temporarily serve as a vehicle maintenance facility during construction of the new facility at 110 S. Paterson Street. Column and wall loads were not provided but are expected to be comparable to those described above.

2921 Perry Street, Madison WI 53713
Telephone: 608/288-4100
FAX: 608/288-7887

SUBSURFACE EXPLORATION

The subsurface conditions in the areas of proposed construction were explored by drilling six Standard Penetration Test (SPT) borings (Borings 1 through 7, excluding 6) to planned depths of 40 ft for the vehicle maintenance building addition and three SPT borings (Borings 8, 9 and 10) also to depths of 40 ft for the future dry storage building. Note that Boring 6 was deleted because its location was inaccessible due to overhead power lines. The boring locations were selected by Bray/GAS. The approximate boring locations are shown in plan on the soil boring location maps presented in Appendix B. Ground surface elevations at the boring locations were surveyed by the drillers and are referenced to a stormwater inlet rim near Boring 4 at EL 849.96 ft.

The soil borings were performed by Badger State Drilling (under subcontract to CGC) on November 15-17, 2005 using truck-mounted drill rigs equipped with hollow-stem augers and mud rotary drilling tools. Soil samples were obtained at the boring locations in accordance with SPT techniques (ASTM D1586). The specific procedures used for drilling and sampling are described in Appendix A.

Temporary water table wells were installed in two borings (B5 and B7) to obtain 48-hr water level readings. The water level observations are included at the bottom of the boring logs.

SURFACE CHARACTERISTICS

The 110 S. Paterson site is occupied by the existing vehicle maintenance building, a portion of which is slated for demolition and replacement. The wing to be demolished is a one-story masonry building. The remainder of the site is paved parking area and drives. A fueling facility is located in the parking lot west of the addition and will remain after construction. We understand one or more releases of petroleum products have occurred on the site, and the site has been explored and monitored by another consultant for petroleum contaminants for a number of years.

The site of the future dry storage building is across Paterson Street to the east, behind the existing vehicle storage building. The area is a gravel-surfaced storage yard with various materials stored around the perimeter and two soil stockpiles in the center. Site grades at both locations are flat and are generally in the range of EL 850-851, based on boring elevations.

SITE CONDITIONS

The subsurface profile revealed by the borings is fairly uniform and can be described by the following generalized strata, in descending order:

- 8 to 12 in. of ***asphalt*** and/or ***crushed stone*** base course, except for Boring 7 which has topsoil at the surface; underlain by
- 4.5 to 7.5 ft of miscellaneous ***fill*** consisting of cinders, ash, coal, gravel, sand, clay and glass, with possible topsoil or peat pockets noted in a few locations; followed by
- 3.5 to 26.5 ft of medium stiff to stiff (typically) ***lean clay***, with softer zones near the top of the layer and scattered very stiff zones elsewhere; followed by
- Medium to very dense ***sand strata*** with significant silt/clay content and varying percentages of gravel extending to the maximum depths explored.

Note that the fill is a non-engineered material with a significant proportion of waste material (cinders, ash, glass, etc.).

Groundwater was encountered in the boreholes during or shortly after drilling at depths ranging from about 10 to 24 ft below ground surface (bgs). However, the use of drilling mud to advance the holes has obscured the short-term water levels in the boreholes, and only the two-day readings in the two temporary water table wells (Borings 5 and 7) are considered reliable. These readings show the water table at about 10 to 11 ft bgs. Note also that Gannet Fleming, the environmental consultant at the site, has indicated on their Residual Groundwater Information Map that "the average depth to groundwater is approximately 4 to 5 ft below ground surface when the remediation system is not pumping groundwater." Gannett Fleming's statement puts the static water level at about EL 845.5 ft, or approximately the same elevation at Lake Monona and roughly 4 ft below Lake Mendota. In view of these observations, we estimate that the long-term static water table would be at about EL 846, or approximately 4 ft below grade. Fluctuations in the water table should be expected in response to seasonal variations in precipitation, infiltration, evapotranspiration, pumping rates from nearby wells, lake levels and other factors. Additional details on the soil and groundwater conditions can be found on the boring logs in Appendix B.

The drillers noted possible petroleum odors in most borings, and in some cases the odor was quite strong. We understand that the site has been studied in the past by Gannett Fleming. *However, because these new findings may impact the cost of disposal of soil removed from the site, we recommend additional environmental review be conducted.* Such a review is beyond our area of expertise and is not included in the scope of our work.

DISCUSSION AND RECOMMENDATIONS

The presence of miscellaneous, non-engineered fill and soft zones in the underlying clay stratum pose significant problems in construction on both sites. However, the satisfactory performance of the existing buildings indicate that construction is feasible, provided the cost of dealing with

possible environmental issues can be controlled. Our recommendations for site preparation, as well as foundation, floor slab, below-grade walls and pavement design/construction are presented in the following subsections. Additional information regarding the conclusions and recommendations presented in this report is discussed in Appendix C.

1. Site Preparation/Floor Slab Support

As the initial step in preparing the 110 Paterson Street site for construction, the portion of the existing building slated for removal will be demolished. Building debris, including foundations and floor slabs, should be removed in its entirety from the site and properly disposed of. We next recommend that the existing pavement and any vegetation/ topsoil be stripped to a minimum of 5 to 10 ft beyond the proposed construction areas.

Once the building has been removed at 110 S. Paterson Street, site preparation for footings and floor slabs can proceed on both sites in about the same fashion, due to the similarity in soil conditions. As an overview, we recommend that the existing miscellaneous fill and upper zone of soft clay be removed below foundations and replaced with compacted sand and/or gravel fill. As the most positive means of reducing the risk of floor slab settlement, the fill and soft clay should be removed in their entirety below floor slab areas also. However, in view of the apparently satisfactory performance of the slabs in the existing building, we believe a partial undercut/replacement approach would be appropriate below floor slab areas, *provided a slight risk of settlement possibly leading to minor floor slab distress (i.e., cracking) is acceptable to the owner.*

Assuming partial undercutting/replacement is acceptable below floor slabs, we recommend the following steps be taken:

- The existing fill should be removed to a depth of 1.5 ft below the bottom of the floor slab.
- Excavated soils should be tested for possible environmental contaminants and disposed in a licensed solid waste landfill, if necessary.
- The fill soils and underlying soft clay zones should be removed below foundations, as described in more detail in the next section.
- Following footing construction, the fill soils to be left in place below floor slabs should be thoroughly compacted with a large (i.e., 10 ton) self-propelled vibratory sheepsfoot roller by making at least two passes in each direction.
- A 1-ft layer of breaker rock stone with fines should be placed and compacted in lifts until no further consolidation is evident.

- Finally, a 6-in. layer of subfloor granular fill (e.g., a reasonably well graded sand with less than 5 percent passing the No. 200 sieve) should be placed as slab bedding material.

Additional recommendations on floor slab design and construction are included in a later section.

2. Foundation Design

It is our opinion that the proposed structures can be supported on conventional shallow spread foundations following removal of the miscellaneous fill/soft clay to an estimated depth of about 8 ft below grade.

Footing excavations should be performed with a smooth-edged backhoe bucket. We further recommend that a 6-in. layer of breaker rock be placed in the base of each footing excavation and rigorously compacted with a hoe-pak or large plate compactor into the bottom. The undercut areas should be restored with granular fill (i.e., sand and/or gravel with less than 25 percent passing the No. 200 sieve) and compacted to at least 95 percent of modified Proctor (ASTM D1557) dry density. For stress distribution purposes, the width of undercut excavations should be widened 1 ft for each foot of undercut. Subgrade observation by CGC is recommended to check the adequacy of bearing conditions and recommend additional remedial measures, if necessary. Note that clay soils exposed at the base of the excavation with pocket penetrometer readings of 0.75 tsf or less will also require undercutting.

Provided the foundations are installed in accordance with the preceding recommendations, the following parameters may be used for foundation design:

- Maximum allowable bearing pressure for footings resting on at least 3 ft of compacted fill following undercutting/replacement as described above: 3000 psf
- Minimum foundation widths:
  - Continuous wall footings: 18 in.
  - Column footings: 30 in.
- Minimum footing depths for frost protection: 4 ft

Provided the foundation design/construction recommendations discussed above are followed, we estimate that total and differential settlements should not exceed 1.0 and 0.5 in., respectively.

Alternative methods of foundation and floor slab support may be considered should disposal costs of the fill to be removed from the site become excessive. These alternatives include helical piers and driven pipe piles. Recommendations for these options can be provided at a later date.

In our opinion, the average soil/rock properties in the upper 100 ft of the site (based on SPT N-values averaging between 15 and 50) can be characterized as a stiff soil profile. This characterization would place the site in Site Class D for seismic design according to the International Building Code (see Table 1615.1.1).

3. Floor Slabs

In our opinion, the floor slabs for the structures can be supported after partially undercutting and replacing the existing fill to 1.5 ft below the slab as described above and may be designed using a subgrade modulus of 100 pci. Prior to slab construction, the subgrades should be recompacted to densify soils that may become disturbed or loosened during construction activities such that non-yielding conditions are developed. As mentioned previously, to serve as a capillary break, the final 6 in. of soil placed below the slab should consist of an imported well-graded sand or gravel with no more than 5 percent by weight passing the No. 200 U.S. standard sieve. To further minimize the potential for moisture migration, a plastic vapor barrier could also be utilized. Fill and drainage course material below the floor slab should be placed as described in the Site Preparation section of this report.

The floor slabs should be isolated from the building walls and columns with a compressible filler, and the design should include an adequate number of isolation and contraction joints.

4. Below-Grade Walls

We anticipate that the below-grade walls for the proposed hoist pit will be rigidly framed. Therefore, *at-rest* lateral earth pressures should be used during design. To minimize the buildup of such pressures, high-quality backfill should be placed within 4 to 6 ft of the walls. The granular backfill should be an imported, well-graded sand or gravel having no more than 12 percent passing the No. 200 U.S. standard sieve.

Current groundwater levels are about 10 to 11 ft below grade but may rise to within 4 ft of the ground surface with time. Two options are available for designing the pit walls and slab: (1) they can be designed as a watertight structure to resist the uplift forces due to a water level at EL 846 or (2) they can incorporate an underdrain system to artificially lower the water table on a permanent basis below the pit. The underdrain system would include a 12-in. thick layer of 3/4-in. clear stone below the base and against the pit walls up to EL 846 with a geotextile fabric (Mirafi 160N or equivalent) separating the stone from the native soils. The drainage layer should be connected to a sump with pumps to remove the infiltrating water. Depending on the sensitivity to water damage

of the equipment in the pit, redundant/backup systems may be necessary, such as a duplicate pump and an emergency generator.

Before placing the pit wall backfill, the exterior walls should be damp-proofed with spray-applied or mopped-on rubber or bituminous sealer or a waterproof membrane applied if the pit is designed to be watertight. Compaction of backfill within 3 ft of the walls should be performed with lightweight equipment to avoid the development of excessive lateral earth pressures. The backfill should be compacted to a minimum of 93 percent modified Proctor following Appendix D guidelines. Lower level walls constructed in accordance with the above recommendations may be designed for an equivalent fluid pressure of 55 psf per ft of depth.

5. Pavement Design

We assume the parking lot/access drive pavement will be exposed to significant truck traffic (i.e., a medium to heavy traffic class). The pavement design will likely be controlled by the miscellaneous soils expected at subgrade elevation across some of the site. After stripping to subgrade elevations and prior to fill placement, the subgrade soils should be recompacted and proof-rolled as discussed in the Site Preparation section of this report. The pavement section tabulated below was selected assuming a CBR value of approximately 2 for the miscellaneous fill soils anticipated at subgrade elevation and a design life of 20 years.

TABLE 1
RECOMMENDED PAVEMENT SECTIONS

Material	Truck Drive Areas Thickness (in.)	DOT Specification[1]
Bituminous surface course	1.75	Section 460, Table 460-1, 12.5 mm
Bituminous binder course	2.25	Section 460, Table 460-1, 19.0 mm
Dense graded base course	6.0	Sections 301 and 305, 31.5 mm
3" Dense graded base course or breaker run	12.0	Sections 301 and 305, 75 mm or Section 311
TOTAL THICKNESS	22.0	

Notes:

1. Wisconsin DOT *Standard Specifications for Highway and Structure Construction*, 2003 Edition, including supplemental specifications.

2. Compaction requirements:
   - Bituminous concrete: Refer to Section 460.3
   - Base course: Refer to Section 301.3.4.2, Standard Compaction

3. Mixture Type E-1 bituminous pavement is recommended; refer to Section 460, Table 460-2 of the *Standard Specifications*.

The pavement design assumes a stable non-yielding subgrade and a regular program of preventative maintenance. If there is a delay between subgrade preparation and placing the base course, the subgrade should be recompacted.

Pavement areas subjected to concentrated wheel loads (i.e., loading docks, dumpster pads, etc.) should be constructed of Portland cement concrete. The slab should be a minimum of 6-in. thick and should contain mesh reinforcement for crack control. A subgrade modulus of 100 pci may be used for design of rigid pavements founded on 12 in. of breaker rock over proof-rolled existing fill soils.

6. Corrosion Potential

Because of the presence of miscellaneous fill containing cinders, ash and similar refuse-type materials, we recommend that any metallic pipe or conduit used on the project be protected against corrosion or replaced with plastic materials.

CONSTRUCTION CONSIDERATIONS

Due to variations in weather, construction methods and other factors, specific construction problems are difficult to predict. Soil-related difficulties which could be encountered on the site are discussed below:

- Due to the potentially sensitive nature of some of the on-site surficial soils to construction traffic disturbance, we recommend that general site grading activities be completed during dry weather, if possible. Earthwork construction during the early spring or late fall could be complicated as a result of wet weather and freezing temperatures. Also, to the extent practical, construction traffic should be kept off prepared subgrades to minimize their disturbance.

- During cold weather, exposed subgrades should be protected from freezing before and after footing construction. Fill should never be placed while frozen.

- Excavations extending greater than 4 ft in depth below the existing ground surface should be sloped or braced in accordance with current OSHA standards, if it is necessary for workers to enter the excavation.

- Based on observations made during the field investigation, groundwater infiltration into undercut excavations for foundations should be expected. Water accumulating at the base of the excavations as a result of precipitation or seepage should be quickly removed using pumps operating from filtered sump pits. The layer of breaker run stone recommended in the base of footing undercut excavations should assist with the dewatering effort.

RECOMMENDED CONSTRUCTION MONITORING

The quality of the foundation and floor slab subgrades will largely be determined by the level of care exercised during site development. To check that earthwork and foundation construction proceeds in accordance with our recommendations, the following operations should be monitored by CGC:

- Site stripping/subgrade proof-rolling within the construction areas;
- Fill placement and compaction;
- Foundation excavation and subgrade preparation; and
- Concrete placement.

CLOSING REMARKS

It has been a pleasure to serve you on this project. If you have any questions or need additional consultation, please contact us.

Sincerely,

CGC, INC.

William W. Wuellner, P.E.
Senior Geotechnical Engineer

Michael N. Schultz, P.E.
Principal/Consulting Professional

Encl: Appendix A - Field Exploration
Appendix B - Soil Boring Location Maps (2)
Logs of Test Borings (9)
Log of Test Boring-General Notes
Unified Soil Classification System
Appendix C - Document Qualifications
Appendix D - Recommended Compacted Fill Specifications

cc: Mr. Chris Romney, Bray & Associates, Madison
Mr. Fred Groth, Graef Anhalt Schloemer, Madison

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

Nine standard penetration test borings were drilled on November 15-17, 2005 at locations selected by Bray and GAS. The approximate locations of the borings are shown on the Boring Location Maps presented in Appendix B. The soil borings were drilled to depths of 40 ft by Badger State Drilling using truck-mounted drill rigs equipped with hollow-stem augers and mud rotary tooling. Ground surface elevations were surveyed by the drillers and are referenced to the inlet rim near Boring 4 at an elevation of 849.96 ft (USGS datum).

Soil samples were obtained at 2.5-ft intervals for a depth of 10 ft and at 5-ft intervals thereafter. The soil samples were obtained in general accordance with specifications for standard penetration testing, ASTM D 1586. The specific procedures used for drilling and sampling are described below.

1. Boring Procedures between Samples

   The boring is extended downward, between samples, by a hollow-stem auger.

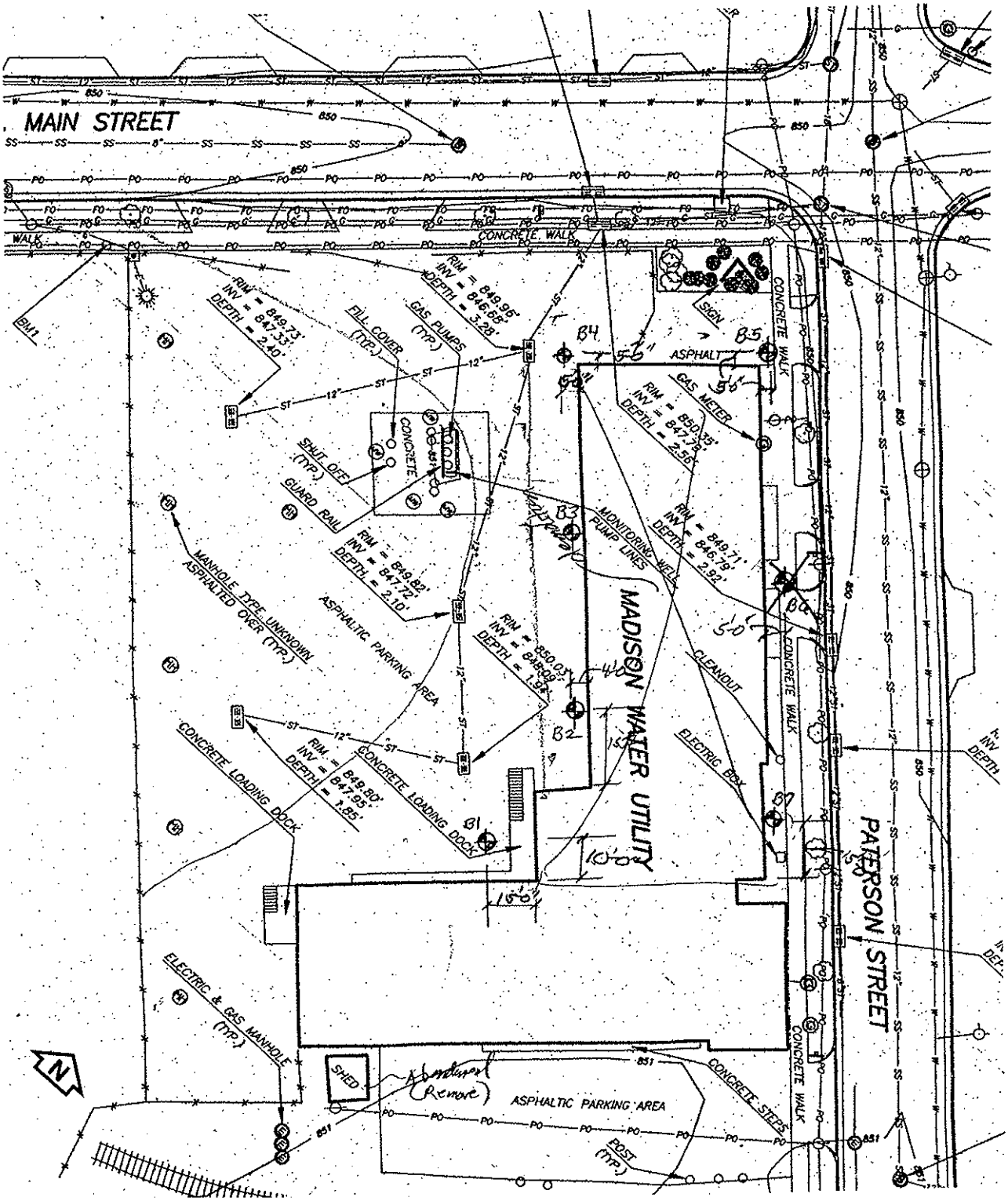
2. Standard Penetration Test and Split-Barrel Sampling of Soils
   (ASTM Designation: D 1586)

   This method consists of driving a 2-inch outside diameter split barrel sampler using a 140-pound weight falling freely through a distance of 30 inches. The sampler is first seated 6 inches into the material to be sampled and then driven 12 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the log of borings and is known as the Standard Penetration Resistance. Recovered samples are first classified as to texture by the driller.

During the field exploration, the driller visually classified the soil and prepared a field log. *Field screening of the samples for possible environmental contaminants was not conducted by the drillers, as environmental site assessment activities were not part of CGC's work scope.* Water level observations were made in each boring during and after drilling and are shown at the bottom of each boring log. Upon completion of drilling, the borings were backfilled with bentonite in accordance with WDNR regulations, and the soil samples were delivered to our laboratory for visual classification and laboratory testing. The soils were visually classified by a geotechnical engineer using the Unified Soil Classification System. The final logs prepared by the engineer and a description of the Unified Soil Classification System are presented in Appendix B.

APPENDIX B

SOIL BORING LOCATION MAPS (2)
LOGS OF TEST BORINGS (9)
LOG OF TEST BORING - GENERAL NOTES
UNIFIED SOIL CLASSIFICATION SYSTEM



Legend

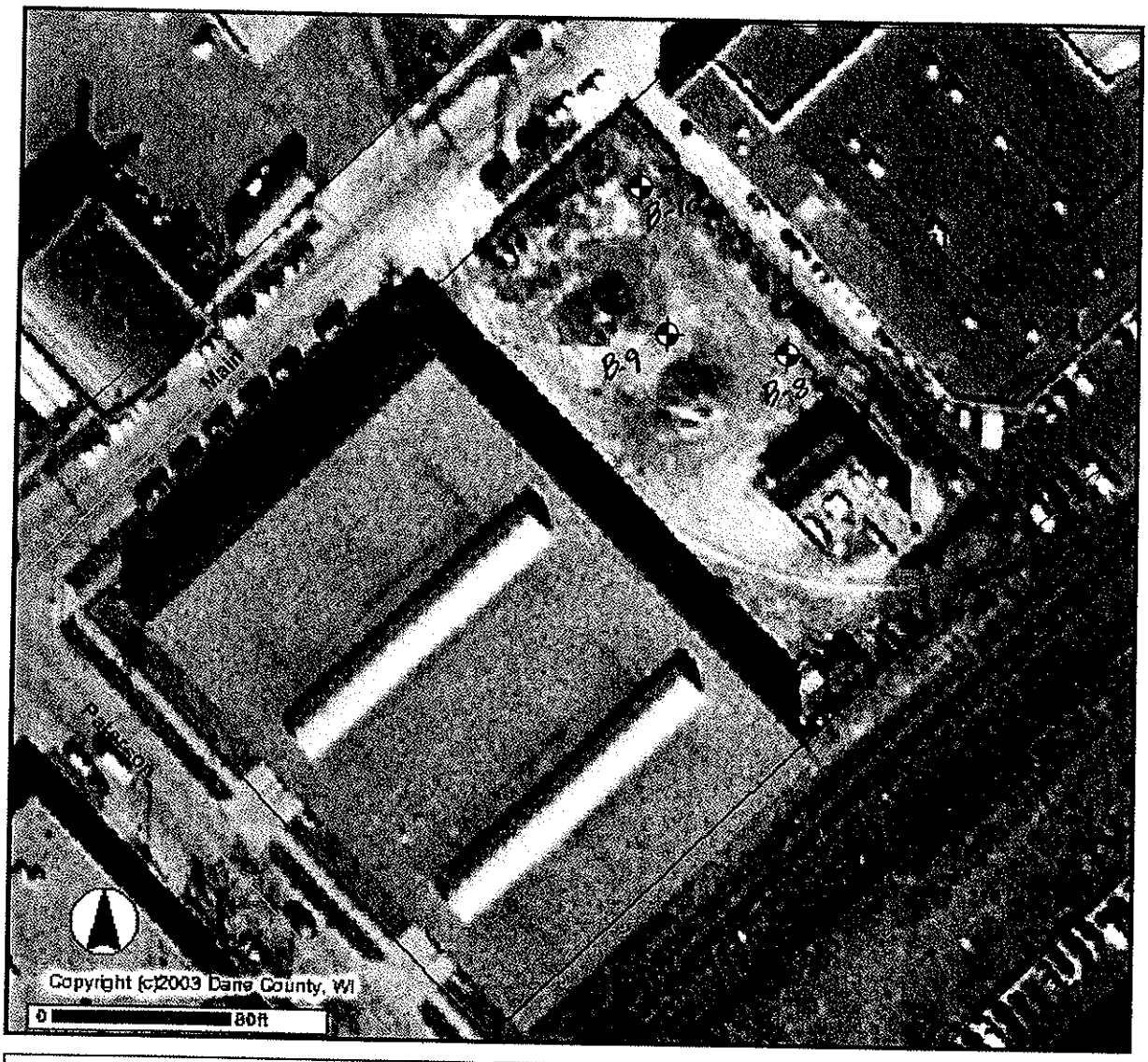
Recent Soil Boring location and number

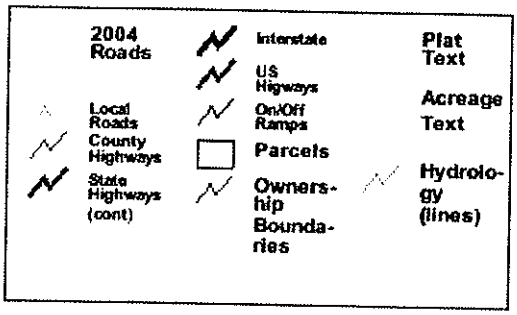
Notes

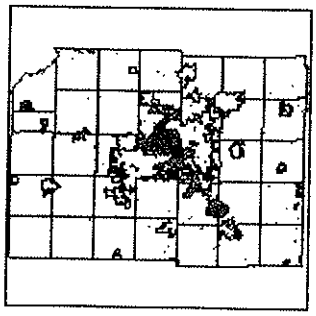
1. Borings were performed by Badger State Drilling in November 2005.
2. Base map obtained from Rettler Corp. via GAS/Bray.
3. Boring locations are approximate.

Date: 12/05	CGC, Inc.	**SOIL BORING LOCATION MAP** **110 S. Paterson Street Vehicle Maintenance Facility** **Madison, Wisconsin**
Job No. C05459		

Temp Veh Maint Fac







DCiMap

DISCLAIMER
This map was prepared using the Dane County DCiMap online geographic information system. All information is believed accurate but is NOT guaranteed to be without error. This map and its underlying data is intended to be used as a general index to land related information and is not intended for detailed, site-specific analysis. Dane County GIS datasets used to produce this map are copyrighted.

Legend

Recent Soil Boring location and number

Notes

1. Borings were performed by Badger State Drilling in November 2005.
2. Base map obtained from Dane County DCI Map.
3. Boring locations are approximate.

Date: 12/05	CGC, Inc.	SOIL BORING LOCATION MAP 109 S. Paterson Street "Temp. Vehicle Maintenance Facility" Madison, Wisconsin
Job No. C05459		

CGC Inc.

LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**
110 S. Paterson Street
Location **Madison, Wisconsin**

Boring No. **1**
Surface Elevation (ft) **850.6**
Job No. **C05459**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
						5" Asphalt/5" Base Course					
1	■	10	M	23		FILL: Black/Brown Cinders, Ash, Sand, Clay, Glass, Sand					
2	■	8	M	3	5						
3	■	10	M	3		Peat Seam near 6.5 ft	(0.75)				
4	■	12	M	6	10	Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
5	■	12	M	49	15	Medium to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
6	■	12	M	64	20	▼					
7	■	9	W	100 /3"	25	▽					
8	■	5	W	100 /5"	30	Probable Boulder at 29 ft					
9	■	12	W	26	35						
10	■	12	W	40	40						
						End Boring at 40 ft Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling					
					45						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **24.0'** Upon Completion of Drilling _____
Time After Drilling _____ _____ _____ **1/4 hr**
Depth to Water _____ _____ _____ **20.0'** ▼
Depth to Cave in _____ _____ _____ **25.0'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/15/05** End **11/15/05**
Driller **Badger** Chief **AP** Rig **B-59**
Logger **AP** Editor **WWW**
Drill Method **4 1/4" HSA**

CGC Inc.

LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**
110 S. Paterson Street
Location **Madison, Wisconsin**

Boring No. **2**
Surface Elevation (ft) **850.5**
Job No. **C05459**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
						6" Asphalt/4" Base Course					
1	■	12	M	66		FILL: Black/Brown Cinders, Ash, Sand, Clay, Glass					
2	■	10	M	2	5						
3	■	12	M	5		Medium Stiff, Gray Lean CLAY (CL) with Rootlets	(0.75)				
4	■	12	M	6	10	Stiff to Very Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
5	■	12	M	28	15		(2.5)				
6	■	12	W	18	20	Medium to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
7	■	10	W	80	25						
8	■	12	W	54	30						
9	■	12	W	100 /5"	35						
10	■	14	W	100 /2"	40	End Boring at 40 ft Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling					
					45						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **16.0'** Upon Completion of Drilling _____
Time After Drilling _____
Depth to Water _____ ▼
Depth to Cave in _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/15/05** End **11/15/05**
Driller **Badger** Chief **AP** Rig **B-59**
Logger **AP** Editor **WWW**
Drill Method **4 1/4" HSA: 0-20'**
DM/RB: 20-40'

CGC Inc.

LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**
110 S. Paterson Street
Location **Madison, Wisconsin**

Boring No. **3**
Surface Elevation (ft) **850.7**
Job No. **C05459**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	LI
						5" Asphalt/5" Base Course					
1		10	M	58		FILL: Black/Brown/Gray Cinders, Coal, Sand, Gravel, Ash, Possible Peat Seam at Base					
2		12	M	10	5						
3		12	M	4			(0.5)				
4		12	M	12	10	Medium Stiff, Dark Gray/Brown (Mottled) Lean CLAY (CL)	(0.75)				
5		12	M	10	15	Stiff to Very Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
6		12	W	13	20		(2.25)				
7		12	W	17	25	Medium Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
8		12	W	107	30						
9		12	W	100 /4"	35						
10		2	W	100 /2"	40	End Boring at 40 ft Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling					
					45						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **18.5'** Upon Completion of Drilling
Time After Drilling
Depth to Water ▼
Depth to Cave in **25.0'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/15/05** End **11/15/05**
Driller **Badger** Chief **AP** Rig **B-59**
Logger **AP** Editor **WWW**
Drill Method **4 1/4" HSA: 0-10'**
DM/RB: 10-40'

CGC Inc.

LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**
110 S. Paterson Street
Location **Madison, Wisconsin**

Boring No. **4**
Surface Elevation (ft) **850.4**
Job No. **C05459**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	LI
						6" Asphalt/4" Base Course					
1		2	M	12		FILL: Brown Fine to Coarse Sand, Some Gravel and Silt					
2		12	M	11		FILL: Black Ash, Peat, Topsoil					
3		11	M	5	5		(0.25-0.5)				
4		12	M	5		Soft to Medium Stiff, Dark Gray/Gray (Mottled) Lean CLAY (CL)	(0.75)				
					10	Medium Stiff to Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams					
5		12	M	7			(0.5-0.75)				
					15	▽					
6		12	W	13			(2.0)				
					20						
7		18	W	12			(1.5)				
					25						
						Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
8		12	W	75	30						
9		8	W	100 /4"	35						
10		1	W	100 /2"	40						
						End Boring at 40 ft Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling					
					45						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **18.0'** Upon Completion of Drilling _____
Time After Drilling _____
Depth to Water _____ ▼
Depth to Cave in _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/15/05** End **11/15/05**
Driller **Badger** Chief **AP** Rig **B-59**
Logger **AP** Editor **WWW**
Drill Method **4 1/4" HSA: 0-10'**
DM/RB: 10-40'

CGC Inc.

LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**
110 S. Paterson Street
Location **Madison, Wisconsin**

Boring No. **5**
Surface Elevation (ft) **850.3**
Job No. **C05459**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	LI
						2" Asphalt Pavement/10" Silty Gravel					
1		18	M	5		FILL: Brown/Orange/Gray/Black Cinders, Ash, Sand, Gravel					
2		14	M	4	5						
3		18	M	0		Medium Stiff to Stiff, Gray Lean CLAY (CL)	(0.5)				
4		18	M	5	10		(1.5)				
5		18	M	5	15	Stiff, Gray/Brown Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
6		18	W	7	20		(1.5)				
7		18	W	7	25		(1.5)				
8		12	W	6	30	Loose, Yellow Brown Fine SAND, Some Silt (SM)					
9		10	W	50 /6"	35	Very Dense, Yellow- Brown/Brown Fine to Coarse GRAVEL, Some Sand and Silt (GM)					
10		5	W	50 /5"	40	Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
					45	End Boring at 39 ft Temporary well set to 20' & pulled on 11/17 Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling					

WATER LEVEL OBSERVATIONS

While Drilling ▽ **13.5'** Upon Completion of Drilling **26.6'**
Time After Drilling **2 days**
Depth to Water **10.2'** ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/15/05** End **11/15/05**
Driller **Badger** Chief **JHR** Rig **CME-55**
Logger **JHR** Editor **WWW**
Drill Method **2 1/4" HSA**

CGC Inc.

LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**
110 S. Paterson Street
Location **Madison, Wisconsin**

Boring No. **7**
Surface Elevation (ft) **849.8**
Job No. **C05459**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
						Black Sandy Silt TOPSOIL FILL					
1		14	M	16		FILL: Brown/Orange/Gray/Black Cinders, Ash, Sand, Gravel					
2		16	M	9	5						
3		18	M	3		Stiff, Brown/Gray (Slightly Mottled) Lean CLAY (CL)	(1.5)				
4		18	M	4	10		(1.5)				
						Very Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams					
5		18	M	9	15		(2.5)				
6		18	M-W	43		Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)	(1.5)				
7		12	M	50/5"	25						
8		10	W	50/5"	30						
9		18	W	53	35						
10		18	W	87	40						
						End Boring at 40 ft Temporary well set to 20' & pulled on 11/17 Borehole backfilled with bentonite chips					
					45						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **18.5'** Upon Completion of Drilling **31.7'**
Time After Drilling **2 days**
Depth to Water **11.1'** ▼
Depth to Cave in

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/15/05** End **11/15/05**
Driller **Badger** Chief **JHR** Rig **CME-55**
Logger **JHR** Editor **WWW**
Drill Method **2 1/4" HSA**

CGC Inc.

LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**
109 S. Paterson Street
Location **Madison, Wisconsin**

Boring No. **8**
Surface Elevation (ft) **850.6**
Job No. **C05459**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	LI
						8" GRAVEL					
1		12	M	79		FILL: Gray Fine to Coarse Sand, Some Gravel and silt					
2		12	M	7							
					5	FILL: Black/Brown Cinders, Ash, Sand, Clay, Glass					
3		12	M	7		Medium Stiff, Gray Silty CLAY, Little Sand (CL-ML)	(0.5)				
4		12	M	15		Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams					
					10	▽					
5		12	W	16			(1.75)				
					15						
6		12	W	21			(2.0)				
					20						
7		12	W	23			(1.75)				
					25						
						Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
8		12	W	37	30						
9		10	W	87							
					35						
10		1	W	100 /1"							
					40	End Boring at 40 ft					
						Borehole grouted with bentonite slurry Possible petroleum odor noted while drilling					
					45						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **11.0'** Upon Completion of Drilling _____
Time After Drilling **1/4 hr**
Depth to Water ▼
Depth to Cave in **25.0'**

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/17/05** End **11/17/05**
Driller **Badger** Chief **AP** Rig **B-59**
Logger **AP** Editor **WWW**
Drill Method **4 1/4" HSA: 0-10'**
DM/RB: 10-40'

CGC Inc.

LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**
109 S. Paterson Street
Location **Madison, Wisconsin**

Boring No. **9**
Surface Elevation (ft) **850.5**
Job No. **C05459**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	qu (qa) (tsf)	W	LL	PL	LI
						8"± Crushed Stone Base Course					
1		12	M	71		FILL: Brown/Orange/Gray/Black Cinders, Ash, Sand, Gravel					
2		12	M	8	5						
3		12	M	11		Medium Stiff, Gray Silty CLAY, Little Sand (CL-ML)	(0.5)				
4		12	M	10	10		(0.5)				
5		12	W	14		Stiff to Very Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
					15	▽					
6		12	W	33			(1.5)				
					20						
7		12	W	33			(2.75)				
					25						
8		6	W	30		Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
					30						
9		5	W	100 /5"		Numerous Cobbles/Boulders near 35 ft					
					35						
10		2	W	100 /2"							
					40	End Boring at 40 ft					
						Borehole backfilled with bentonite chips					
					45						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **18.0'** Upon Completion of Drilling _____
Time After Drilling _____
Depth to Water _____ ▼
Depth to Cave in _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/17/05** End **11/17/05**
Driller **Badger** Chief **AP** Rig **B-59**
Logger **AP** Editor **WWW**
Drill Method **4 1/4" HSA: 0-10'**
DM/RB: 10-40'

CGC Inc.

LOG OF TEST BORING

Project **Madison Water Utility Vehicle Storage Bldg.**
109 S. Paterson Street
Location **Madison, Wisconsin**

Boring No. **10**
Surface Elevation (ft) **850.6**
Job No. **C05459**
Sheet **1** of **1**

2921 Perry Street, Madison, WI 53713 (608) 288-4100, FAX (608) 288-7887

SAMPLE No.	TYPE	Rec (in.)	Moist	N	Depth (ft)	VISUAL CLASSIFICATION and Remarks	SOIL PROPERTIES qu (qa) (tsf)	W	LL	PL	LI
						4" Crushed Stone Base Course					
1		12	M	30		FILL: Brown/Orange/Gray/Black Cinders, Ash, Sand, Gravel					
2		12	M	7	5						
3		11	M	11		Medium Stiff, Gray Silty CLAY, Little Sand (CL-ML)	(0.5)				
4		15	M	9		Stiff, Gray Lean CLAY (CL) with Occasional Thin Sand and Silt Seams	(1.5)				
					10						
5		12	W	28			(1.5)				
					15						
6		12	W	22							
					20						
						Medium Dense to Dense to Very Dense, Brown Fine to Medium SAND, Some Silt and Gravel, Little Clay, Occasional Cobbles/Boulders (SM)					
7		12	W	26	25						
						Large Boulder from 28 to 31.5 ft					
8		0	W	100 /0"	30						
9		0	W	100 /0"	35						
10		0	W	100 /0"	40	End Boring at 40 ft					
						Borehole grouted with bentonite slurry					
					45						

WATER LEVEL OBSERVATIONS

While Drilling ▽ **10.0'** Upon Completion of Drilling _____
Time After Drilling _____
Depth to Water _____ ▼
Depth to Cave in _____

The stratification lines represent the approximate boundary between soil types and the transition may be gradual.

GENERAL NOTES

Start **11/17/05** End **11/17/05**
Driller **Badger** Chief **AP** Rig **B-59**
Logger **AP** Editor **WWW**
Drill Method **4 1/4" HSA: 0-10'**
DM/RB: 10-40'

CGC, Inc.

LOG OF TEST BORING

General Notes

Descriptive Soil Classification

GRAIN SIZE TERMINOLOGY

Soil Fraction	Particle Size	U.S. Standard Sieve Size
Boulders	Larger than 12"	Larger than 12"
Cobbles	3" to 12"	3" to 12"
Gravel: Coarse	3/4" to 3"	3/4" to 3"
Fine	4.76 mm to 3/4"	#4 to 3/4"
Sand: Coarse	2.00 mm to 4.76 mm	#10 to #4
Medium	0.42 to mm to 2.00 mm	#40 to #10
Fine	0.074 mm to 0.42 mm	#200 to #40
Silt	0.005 mm to 0.074 mm	Smaller than #200
Clay	Smaller than 0.005 mm	Smaller than #200

Plasticity characteristics differentiate between silt and clay.

GENERAL TERMINOLOGY

Physical Characteristics
Color, moisture, grain shape, fineness, etc.
Major Constituents
Clay, silt, sand, gravel
Structure
Laminated, varved, fibrous, stratified, cemented, fissured, etc.
Geologic Origin
Glacial, alluvial, eolian, residual, etc.

RELATIVE DENSITY

Term	"N" Value
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

RELATIVE PROPORTIONS OF OF COHESIONLESS SOILS

Proportional Term	Defining Range by Percentage of Weight
Trace	0%-5%
Little	5%-12%
Some	12%-35%
And	35%-50%

CONSISTENCY

Term	q_u-tons/sq. ft.
Very Soft	0.0 to 0.25
Soft	0.25 to 0.50
Medium	0.50 to 1.0
Stiff	1.0 to 2.0
Very Stiff	2.0 to 4.0
Hard	Over 4.0

ORGANIC CONTENT BY COMBUSTION METHOD

Soil Description	Loss on Ignition
Non Organic	Less than 4%
Organic Silt/Clay	4-12%
Sedimentary Peat	12-50%
Fibrous and Woody Peat	More than 50%

PLASTICITY

Term	Plastic Index
None to Slight	0-4
Slight	5-7
Medium	8-22
High to Very High	Over 22

The penetration resistance, N, is the summation of the number of blows required to effect two successive 6" penetrations of the 2" split-barrel sampler. The sampler is driven with a 140 lb. weight falling 30" and is seated to a depth of 6" before commencing the standard penetration test.

SYMBOLS

DRILLING AND SAMPLING

CS--Continuous Sampling
RC--Rock Coring: Size AW, BW, NW, 2"W
RQD--Rock Quality Designator
RB--Rock Bit
FT--Fish Tail
DC--Drove Casing
C--Casing: Size 2 1/2", NW, 4", HW
CW--Clear Water
DM--Drilling Mud
HSA--Hollow Stem Auger
FA--Flight Auger
HA--Hand Auger
COA--Clean-Out Auger
SS--2" Diameter Split-Barrel Sample
2ST--2" Diameter Thin-Walled Tube Sample
3ST--3" Diameter Thin-Walled Tube Sample
PT--3" Diameter Piston Tube Sample
AS--Auger Sample
WS--Wash Sample
PTS--Peat Sample
PS--Pitcher Sample
NR--No Recovery
S--Sounding
PMT--Borehole Pressuremeter Test
VS--Vane Shear Test
WPT--Water Pressure Test

LABORATORY TESTS

q_a--Penetrometer Reading, tons/sq. ft.
q_u--Unconfined Strength, tons/sq. ft.
W--Moisture Content, %
LL--Liquid Limit, %
PL--Plastic Limit, %
SL--Shrinkage Limit, %
LI--Loss on Ignition, %
D--Dry Unit Weight, lbs/cu. ft.
pH--Measure of Soil Alkalinity or Acidity
FS--Free Swell, %

WATER LEVEL MEASUREMENT

▽ --Water Level at time shown
NW--No Water Encountered
WD--While Drilling
BCR--Before Casing Removal
ACR--After Casing Removal
CW--Caved and Wet
CM--Caved and Moist

Note: Water level measurements shown on the boring logs represent conditions at the time indicated and may not reflect static levels, especially in cohesive soils.

UNIFIED SOIL CLASSIFICATION SYSTEM

COARSE-GRAINED SOILS

(More than half of material is larger than No. 200 seive size.)

GRAVELS More than half of coarse fraction larger than No. 4 sieve size	**Clean Gravels** (Little or no fines)	
	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines
	Gravels with Fines (Appreciable amount of fines)	
	GM^{d}_{u}	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
SANDS More than half of coarse fraction smaller than No. 4 sieve size	**Clean Sands** (Little or no fines)	
	SW	Well-graded sands, gravelly sands, little or no fines
	SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with Fines (Appreciable amount of fines)	
	SM^{d}_{u}	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures

FINE-GRAINED SOILS

(More than half of material is smaller than No. 200 sieve.)

SILTS AND CLAYS Liquid limit less than 50%	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS	PT	Peat and other highly organic soils

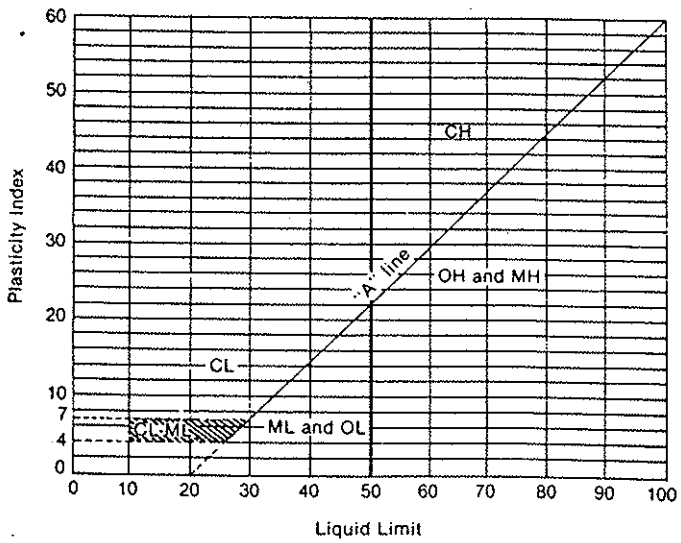
LABORATORY CLASSIFICATION CRITERIA

GW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for SW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 per cent ..... GW, GP, SW, SP
More than 12 per cent ..... GM, GC, SM, SC
5 to 12 per cent ..... Borderline cases requiring dual symbols

PLASTICITY CHART



For classification of fine-grained soils and fine fraction of coarse-grained soils.

Atterberg Limits plotting in hatched area are borderline classifications requiring use of dual symbols.

Equation of A-line: PI = 0.73 (LL - 20)

APPENDIX C

DOCUMENT QUALIFICATIONS

APPENDIX C
DOCUMENT QUALIFICATIONS

I. GENERAL RECOMMENDATIONS/LIMITATIONS

CGC, Inc. should be provided the opportunity for a general review of the final design and specifications to confirm that earthwork and foundation requirements have been properly interpreted in the design and specifications. CGC should be retained to provide soil engineering services during excavation and subgrade preparation. This will allow us to observe that construction proceeds in compliance with the design concepts, specifications and recommendations, and also will allow design changes to be made in the event that subsurface conditions differ from those anticipated prior to the start of construction. CGC does not assume responsibility for compliance with the recommendations in this report unless we are retained to provide construction testing and observation services.

This report has been prepared in accordance with generally accepted soil and foundation engineering practices and no other warranties are expressed or implied. The opinions and recommendations submitted in this report are based on interpretation of the subsurface information revealed by the test borings indicated on the location plan. The report does not reflect potential variations in subsurface conditions between or beyond these borings. Therefore, variations in soil conditions can be expected between the boring locations and fluctuations of groundwater levels may occur with time. The nature and extent of the variations may not become evident until construction.

II. IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one - not even you* - should apply the report for any purpose or project except the one originally contemplated.

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report* that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes - even minor ones - and request an assessment of their impact. *CGC cannot accept responsibility or liability for problems that occur because our reports do not consider developments of which we were not informed.*

SUBSURFACE CONDITIONS CAN CHANGE

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

MOST GEOTECHNICAL FINDINGS ARE PROFESSIONAL OPINIONS

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are

taken. Geotechnical engineers review field and laboratory data and then apply their professional judgement to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ - sometimes significantly - from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A REPORT'S RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgement and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *CGC cannot assume responsibility or liability for the report's recommendations if we do not perform construction observation.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having CGC participate in prebid and preconstruction conferences, and by providing construction observation.

DO NOT REDRAW THE ENGINEER'S LOGS

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

GIVE CONTRACTORS A COMPLETE REPORT AND GUIDANCE

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

READ RESPONSIBILITY PROVISIONS CLOSELY

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineer's responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

GEOENVIRONMENTAL CONCERNS ARE NOT COVERED

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

RELY ON YOUR GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE

Membership in ASFE exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with CGC, a member of ASFE, for more information.

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ASFE
8811 Colesville Road, Suite G 106
Silver Spring, MD 20910

APPENDIX D

RECOMMENDED COMPACTED FILL SPECIFICATIONS

APPENDIX D

CGC, INC.

RECOMMENDED COMPACTED FILL SPECIFICATIONS

Fill Materials

Proposed fill shall contain no vegetation, roots, topsoil, peat, ash, wood or any other non-soil material which by decomposition might cause settlement. Also, fill shall never be placed while frozen or on frozen surfaces. Rock, stone or broken concrete greater than 6 in. in the largest dimension shall not be placed within 10 ft of the building area. Fill used greater than 10 ft beyond the building limits shall not contain rock, boulders or concrete pieces greater than a 2 sq ft area and shall not be placed within the final 2 ft of finish subgrade or in designated utility construction areas. The rock, boulders or concrete pieces should contain finer material to fill in void spaces between the larger material.

Placement Method

The approved fill shall be placed, spread and leveled in layers generally not exceeding 10 in. in thickness before compaction. The fill shall be placed at a moisture content capable of achieving the desired compaction level. For clay soils or granular soils containing an appreciable amount of cohesive fines, moisture conditioning will likely be required.

It is the Contractor's responsibility to provide all necessary compaction equipment and other grading equipment that may be required to attain the specified compaction. Hand-guided vibratory or tamping compactors will be required whenever fill is placed adjacent to walls, footings, columns or in confined areas.

Compaction Specifications

Maximum dry density and optimum moisture content of the fill soil shall be determined in accordance with modified Proctor methods (ASTM D1557). The recommended field compaction as a percentage of the maximum dry density is shown in Table 1.

Table 1
Compaction Guidelines

Area	Percent Compaction+ Clay/Silt	Sand/Gravel
Within 10 feet of building lines		
• Footing bearing soils	93-95	95
• Under floors, steps and walks		
- Lightly loaded floor slab	90	90
- Heavily loaded floor slab & thicker fill zones	92	95
Beyond 10 feet of building lines		
• Under walks and pavements		
- Less than 2 ft below subgrade	92	95
- Greater than 2 ft below subgrade	90	90
• Landscaping	85	90

NOTES:

+ Based on Modified Proctor (ASTM D 1557)

Testing Procedures

Representative samples of proposed fill shall be submitted to CGC, Inc. for optimum moisture-maximum density determination (ASTM D1557) prior to the start of fill placement. The sample size should be approximately 50 lb.

CGC, Inc. shall be retained to perform field density tests to determine the level of compaction being achieved in the fill. The tests shall generally be conducted on each lift at the beginning of fill placement and at a frequency mutually agreed upon by the project team for the remainder of the project.

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under separate contracts.
5. Purchase contracts.
6. Owner-furnished products.
7. Access to site.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and drawing conventions.
11. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Reconstruction of the Madison Water Utility Operations Center, 110 S. Paterson Street, Contract No. 7529.

1. Project Location: 110 S. Paterson Street, Madison, WI

B. Owner: Madison Water Utility, City of Madison, 1600 Emil St, Madison, WI 53713

1. Owner's Representative: Al Larson.

C. Architect: Mead & Hunt, Inc.

D. Civil, Plumbing, Mechanical, Electrical, and Technology: Mead & Hunt, Inc.

E. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Structural Engineer: Graef, Fred Groth P.E., 5126 West Terrace Drive, Suite 111, Madison, WI. 53718, Telephone: 608-242-1550

2. Landscape Architect: Ken Saiki Design, Ken Saiki, 303 S. Paterson St, Madison, WI 53703, Telephone: 608-251-3600

F. Project Web Site: A project Web site administered by Contractor will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination." for requirements for establishing administering and using the Project Web site.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Demolition (approx.. 10,400 sf), renovation (approx.. 15,940 sf), and addition (approx.. 23,930 sf) to the one and two-story, load-bearing masonry Madison Water Utility Operations Center. Work includes associated site and utility work and limited offsite work as identified in Drawings (demolition of 1,700sf paint shop and demolition of 200sf shed). Work includes phasing to allow for continuous Owner occupancy in business and maintenance garage occupancies. New construction includes load-bearing masonry and structural steel superstructure with precast floor planks. Exterior walls are clad with metal panel, aluminum composite panel, brick, or precast. Low-slope EPDM roof with vegetative area as identified on drawings. Work includes renovation, replacement and new heating, ventilation, air conditioning, electrical, plumbing, fire protection and technology systems.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 PHASED CONSTRUCTION

A. The Work shall be conducted in 3 phases, with each phase substantially complete as indicated:

1. Phase 1: Demolition and renovation work at east wing of existing facility. Work of this phase shall commence within 7 days after the Notice to Proceed and be substantially complete and ready for occupancy within 30 days after the Notice to Proceed (Anticipated September 8th, 2015 – October 8th, 2015).

2. Phase 2: Demolition and new construction work at west wing of existing facility. Work of this phase shall commence in conjunction with Phase 1 construction and be substantially complete and ready for occupancy within 365 days after the Notice to Proceed (Anticipated September 8th, 2015 – September 7th, 2016).

3. Phase 3: The remaining Work shall commence after Phase 2 construction is substantially complete and ready for occupancy, and be substantially complete within 180 days after Phase 2 (Anticipated September 7th, 2016 – March 15th, 2017).

B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence, commencement and completion dates, and move-out and -in dates of Owner's personnel for all phases of the Work.

1.6 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with 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 separate contracts.

B. Preceding Work: Owner has awarded separate contract(s) for the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.

1. Asbestos Abatement: KPH Environmental for asbestos abatement at flooring mastic at existing facility.

C. Concurrent Work: Owner has awarded a separate contract for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.

1. Asbestos Abatement: KPH Environmental for asbestos abatement at doors, windows, and roofing.

1.7 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished Products:

1. Base Bid: Equipment as indicated on Drawings, specified in Section 144500 “Vehicle Lifts”, 412213.13 “Bridge Crane”, 412213.19 “Jib Cranes and Booms”, noted Paint Booth, and equipment listed in the Bulk Fluid System Equipment List appended to specification Section 012300.

2. Alternate No 1: Contractor to furnish and install equipment as indicated on Drawings and specified in Section 144500 “Vehicle Lifts”, 412213.13 “Bridge Crane”, 412213.19 “Jib Cranes and Booms”, noted Paint Booth, and equipment listed in the Bulk Fluid System Equipment List appended to specification Section 012300.

1.8 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to area identified on drawings.
2. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. 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.

1.9 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.10 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 7 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: Obtain Owner's written permission for weekend hour work.
2. Early Morning Hours: Comply with City of Madison requirements on noise.
3. Hours for Utility Shutdowns: Obtain Owner's written consent for all utility shutdowns.
4. Work is not permitted on City of Madison Holidays: New Year's Day, Martin Luther King Day, Memorial Day, 4th of July, Labor Day, Thanksgiving, and Christmas Day.

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 providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.

F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

A. 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. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

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 published as part of the U.S. National CAD Standard and scheduled on Drawings.
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 011000

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for unit prices.

B. Related Requirements:

1. Section 014000 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price 1: Disposal of existing hazardous material per Section 003126 Existing Hazardous Material Information, and Section 312000 Earth Moving-Site.

1. Description: Hazardous soil material disposal off site as required, according to Section 312000 "Earth Moving-Site."
2. Unit of Measurement: Tons of soil excavated, based on survey of weight removed.

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Contractor-furnished Equipment.

1. Base Bid: Contractor to install Owner-furnished equipment as indicated on Drawings, specified in Section 144500 “Vehicle Lifts”, 412213.13 “Bridge Crane”, 412213.19 “Jib Cranes and Booms”, Paint Booth, and equipment listed in the Bulk Fluid System Equipment List appended to this Document. Work includes coordination with associated work, receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.
2. Alternate: Contractor to furnish and install equipment as indicated on Drawings and specified in Section 144500 “Vehicle Lifts” 412213.13 “Bridge Crane”, 412213.19 “Jib Cranes and Booms”, Paint Booth, and equipment listed in the Bulk Fluid System Equipment List appended to this Document.

END OF SECTION 012300

BULK FLUID EQUIPMENT LIST

PERKINS OIL
QUALITY PETROLEUM PRODUCTS

Quotation

Bill To:
Name:
Company Name Madison Water Utility
Street Address 119 East Olin Ave
City, ST ZIP Code Madison, WI 53713
Phone/Cell: (608) 266-4764
Fax:

DATE [redacted]
Quotation # [redacted]
Customer ID [redacted]
Terms: [redacted]

Quotation valid until: [redacted]
Prepared by: Steve Wesley

Comments or special instructions: Installation of Equipment For Bulk Fluid System

Product Code	Description	Pkg. Size	Quantity	Price Per Unit	AMOUNT
RTT1300	180 gal Poly Stackable Storage Tank	1	4	[redacted]	[redacted]
RTT3200	Drip Tray Holder Kit W/4 Trays	1	2	[redacted]	[redacted]
RTT2100	Tank Stand w/24" Legs	1	2	[redacted]	[redacted]
RTT4001	Brass Spring Valve Spring Release	1	4	[redacted]	[redacted]
MISC	MISC Tank Parts Kit	1	2	[redacted]	[redacted]
SM36554	Samson Electronic Dispensing Meter	1	2	[redacted]	[redacted]
GRHPM65F	Graco Med. Pressure Oil Hose Reel ½" x 50" (Yellow)	1	4	[redacted]	[redacted]
GRHPL25F	Graco Low Pressure Air Hose Reel 3/8"x 65'	1	2	[redacted]	[redacted]
GR256-216	Graco Electronic Pre-Set Dispensing Meter	1	2	[redacted]	[redacted]
GR218-549	Graco Supply Hoses ½" x 24"	1	10	[redacted]	[redacted]
GR225-006	Graco Portable Grease Pump Kit (Keg)	1	2	[redacted]	[redacted]
GR109-075	Graco Air Regulator W/Gauge	1	4	[redacted]	[redacted]
GR24A-938	Graco Reel Mounting Bracket	1	2	[redacted]	[redacted]
GR238-866	Graco Waste Oil Drain Cart	1	1	[redacted]	[redacted]
GR203-987	Graco Pump Wall Mounting Bracket	1	2	[redacted]	[redacted]
GR202-965	Graco Pump Fitting Kit	1	4	[redacted]	[redacted]

BULK FLUID EQUIPMENT LIST

PERKINS OIL
QUALITY PETROLEUM PRODUCTS

Product Code	Description	Pkg. Size	Quantity	Price Per Unit	AMOUNT
GR109-108	Graco Pump Supply Line Hose	1	4	[redacted]	[redacted]
INBV1/2	Brass Ball Valves ½"	1	12	[redacted]	[redacted]
12-8M	Low Pressure Male Connector ¾"x1/2"	1	12	[redacted]	[redacted]
12-12UT	Low Pressure Union Tee ¾"	1	4	[redacted]	[redacted]
12-12U	Low Pressure Union ¾"	1	8	[redacted]	[redacted]
12-12L	Low Pressure Union Elbow ¾"	1	8	[redacted]	[redacted]
12C-035	Low Pressure Steel Tubing ¾"	1 ft.	450	[redacted]	[redacted]
P1011GR	Green Slot Uni-Strut 1' x 1 5/8"	1 ft.	100	[redacted]	[redacted]
46806	Cush A Clamp ¾" OD	1	62	[redacted]	[redacted]
GBPTCA53K	2" Schedule 40 T & C Black Pipe (Remote Fill Lines)	1 ft.	168	[redacted]	[redacted]
GATRC10	All Thread Rod 3/8"	1 ft.	100	[redacted]	[redacted]
MISC	Misc. Parts & Supplies	1	1	[redacted]	[redacted]
DB	2" Brass Dry Break (Remote Fill)	1	4	[redacted]	[redacted]
LIFT	Lift Rental	1	1	[redacted]	[redacted]
LABOR	Labor Hours For Installation	1	110	[redacted]	[redacted]
			Equipment Total:		[redacted]
	Waste Oil Tank Installation				
CLOSURE	Closure of Existing Tank Plans & Permits (State of WI)	1	1	[redacted]	[redacted]
PLANS	Plans & Permits For Tank Install	1	1	[redacted]	[redacted]
INSTALL	Install & Vent Tank Inside	1	1	[redacted]	[redacted]
VENTS	Emergency Vents 4"	1	2	[redacted]	[redacted]
			Equipment Total:		[redacted]
LABOR	Labor For Installation	1 Hour	110	[redacted]	[redacted]
			Project Total:		[redacted]

Phone: 608-221-4736 • Toll Free: 800-634-9937 • Fax: 608-221-9720 • 4707 Pflaum Road, Madison, WI 53718
www.perkinsoil.com

PERKINS OIL
QUALITY PETROLEUM PRODUCTS

NOTE: USAGESALES TAX NOT INCLUDED IN ABOVE COSTS.
MASONRY WORK AND ELECTRICAL NOT INCLUDED IN ABOVE COSTS.
COSTS BASED ON CURRENT STEEL PRICES AND FREIGHT RATES.

AUTHORIZED SIGNATURE [redacted]

PAYMENT TERMS: **PERKINS OIL CO. LOANED EQUIPMENT PROGRAM**

ACCEPTANCE OF PROPOSAL: THE PRICES, PAYMENT TERMS, SPECIFICATIONS AND ATTACHED TERMS OF CONDITIONS OF PROPOSAL ARE SATISFACTORY, AND ARE HEREBY ACCEPTED. PERKINS OIL COMPANY IS AUTHORIZED TO DO THE WORK AS SPECIFIED. SELLER MAY REVOKE THIS PROPOSAL BEFORE ACCEPTANCE.

DATE OF ACCEPTANCE_____**ACCEPTED:**_____
Customer

If you have any questions concerning this quotation, please contact:
Name: Steve Wesley Phone Number: (608) 516-7015 E-mail: swesley@perkinsoil.net
Thank you for the opportunity to provide you with this loaned equipment quote.

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SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 012300 "Alternates" for products selected under an alternate.
2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

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 in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify 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.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
b. Coordination 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 substitution 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. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution 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.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. 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.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

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 Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.

1.5 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.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 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 unless otherwise indicated.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

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 offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.

f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 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. Requests for Information (RFIs).
4. Project Web site.
5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

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 and telephone numbers, including home, 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, and by each temporary telephone. Keep list current at all times.

1.5 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. 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.

C. Conservation: Coordinate construction activities to ensure that operations are carried out 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.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown 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 the coordination drawings by multiple contractors 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 the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

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, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. 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.
6. 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.

7. Electrical Work: Show the following:

    a. Runs 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, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Fire-Protection System: Show the following:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that 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 changes as directed and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as 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. 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: AIA Document G716 or equal.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

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 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 012600 "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: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Use CSI Log Form 13.2B or equal.

F. 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.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT WEB SITE

A. Provide, administer, and use Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:

1. Project directory.
2. Project correspondence.
3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Task and issue management.
7. Photo documentation.
8. Schedule and calendar management.
9. Submittals forms and logs.
10. Payment application forms.
11. Drawing and specification document hosting, viewing, and updating.
12. Online document collaboration.
13. Reminder and tracking functions.
14. Archiving functions.

B. Provide up to seven Project Web site user licenses for use of the Owner, Architect, and Architect's consultants. Provide eight hours of software training at Architect's office for Project Web site users.

C. On completion of Project, provide one complete archive copy(ies) of Project Web site files to Owner and to Architect in a digital storage format acceptable to Architect.

D. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of AIA Document C106 or similar Agreement acceptable to Owner and Architect.

1.9 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.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Contractor is responsible for conducting meeting and 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. Conduct the conference to review responsibilities and personnel assignments.

2. 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.
3. Agenda: Discuss items of significance that could affect progress, including the following:

    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Lines of communications.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.
    l. Preparation of record documents.
    m. Use of the premises and existing building.
    n. Work restrictions.
    o. Working hours.
    p. Owner's occupancy requirements.
    q. Responsibility for temporary facilities and controls.
    r. Procedures for moisture and mold control.
    s. Procedures for disruptions and shutdowns.
    t. Construction waste management and recycling.
    u. Parking availability.
    v. Office, work, and storage areas.
    w. Equipment deliveries and priorities.
    x. First aid.
    y. Security.
    z. Progress cleaning.

4. 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 that requires coordination with other construction.

1. Attendees: 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. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

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. 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. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.

f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Owner's partial occupancy requirements.
k. Installation of Owner's furniture, fixtures, and equipment.
l. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at monthly intervals or more frequently if requested by Owner.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Architect, each contractor, 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 BIM component conflicts.
4) Status of submittals.
5) Status of sustainable design documentation.
6) Deliveries.
7) Off-site fabrication.
8) Access.
9) Site utilization.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.

15) Status of RFIs.
16) Status of proposal requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's construction schedule.
2. Construction schedule updating reports.
3. Daily construction reports.
4. Material location reports.
5. Site condition reports.
6. Special reports.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting schedules and reports.
2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

1.6 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.
    f. Provisions for future construction.
    g. Seasonal variations.
    h. Environmental control.

5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

    a. Structural completion.
    b. Temporary enclosure and space conditioning.
    c. Permanent space enclosure.
    d. Completion of mechanical installation.
    e. Completion of electrical installation.

f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:

1. Completion of Phase 1.
2. Completion of Phase 2.
3. Completion of Phase 3.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 5 days after date established for the Notice to Proceed.

   a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing.
    j. Punch list and final completion.
    k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.

7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.
3. Final completion construction photographs.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting photographic documentation.
2. Section 017700 "Closeout Procedures" for submitting photographic documentation as project record documents at Project closeout.
3. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
4. Section 024119 "Selective Demolition" for photographic documentation before selective demolition operations commence.

1.3 INFORMATIONAL SUBMITTALS

A. Digital Photographs: Submit image files within three days of taking photographs.

1. Digital Camera: Minimum sensor resolution of 8 megapixels.
2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
3. Identification: Provide the following information with each image description in file metadata tag:

    a. Name of Project.
    b. Date photograph was taken.
    c. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.4 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in file name for each image.

C. Preconstruction Photographs: Before commencement of excavation, commencement of demolition, starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag excavation areas and construction limits before taking construction photographs.
2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take 20 photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken. Include photographs of entire site from east, west, north and south vantage points. Provide at least 1 photo of each wall and ceiling condition prior to concealment documenting systems to be concealed by other finishes.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
2. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 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. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. 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.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule 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, the schedule of values, and Contractor's construction schedule.
2. Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

3. 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.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. 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 for use in preparing Shop 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 Software Program: The Contract Drawings are available in <**Insert name and version of digital drawing software program and operating system**>.
    c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
    d. The following digital data files will by furnished for each appropriate discipline:

        1) Floor plans.
        2) Reflected ceiling plans.
        3) Other drawings as requested by Contractor and agreed upon by Architect.

B. 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 different types of submittals for related parts of the Work 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.

C. 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. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

    a. All Specification Sections are subject to sequential Owner review.

5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

    a. All Division 03 Sections.
    b. All Division 04 Sections.
    c. All Division 05 Sections.
    d. All Division 32 Sections.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. 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.
2. Name file with submittal number or other unique identifier, including revision identifier.

a. File name shall use the Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Owner**,** containing the following information:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Contractor.
e. Name of firm or entity that prepared submittal.
f. Names of subcontractor, manufacturer, and supplier.
g. Category and type of submittal.
h. Submittal purpose and description.
i. Specification Section number and title.
j. Specification paragraph number or drawing designation and generic name for each of multiple items.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Related physical samples submitted directly.
n. Indication of full or partial submittal.
o. Transmittal number, numbered consecutively.
p. Submittal and transmittal distribution record.
q. Other necessary identification.
r. Remarks.

E. Options: Identify options requiring selection by Architect.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

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.

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.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Certificates and Certifications Submittals: Provide 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. 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 not suitable 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 showing 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 concurrent with Samples.
6. Submit Product Data in the following format:

    a. PDF electronic file.

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, unless submittal based on Architect's digital data drawing files is otherwise permitted.

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. 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.
3. Submit Shop Drawings in the following format:

    a. PDF electronic file.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
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.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

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. Number of Samples: Submit one 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. Number of Samples: Submit 2 set of Samples. Architect will retain 1 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 sets of paired units 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.
5. Submit product schedule in the following format:

   a. PDF electronic file.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

K. 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.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

M. 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.

N. 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.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. 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.

R. 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.

S. 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:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.

4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

T. 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.

U. 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 primers and substrate preparation needed for adhesion.

V. 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.

W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 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 Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, 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. 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action 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. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, 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.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will mark transmittal form for each submittal with an 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. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 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.

1.3 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.

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.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall 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. AABC - Associated Air Balance Council; www.aabc.comwww.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.

30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.

70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; www.eciaonline.org.
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
81. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
82. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
83. FM Approvals - FM Approvals LLC; www.fmglobal.com.
84. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
85. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
86. FSA - Fluid Sealing Association; www.fluidsealing.com.
87. FSC - Forest Stewardship Council U.S.; www.fscus.org.
88. GA - Gypsum Association; www.gypsum.org.
89. GANA - Glass Association of North America; www.glasswebsite.com.
90. GS - Green Seal; www.greenseal.org.
91. HI - Hydraulic Institute; www.pumps.org.
92. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
93. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
94. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
95. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
96. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
97. IAS - International Accreditation Service; www.iasonline.org.
98. IAS - International Approval Services; (See CSA).
99. ICBO - International Conference of Building Officials; (See ICC).
100. ICC - International Code Council; www.iccsafe.org.
101. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
102. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
103. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
104. IEC - International Electrotechnical Commission; www.iec.ch.
105. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
106. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
107. IESNA - Illuminating Engineering Society of North America; (See IES).
108. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
109. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
110. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
111. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.

112. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
113. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
114. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
115. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
116. ISO - International Organization for Standardization; www.iso.org.
117. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
118. ITU - International Telecommunication Union; www.itu.int/home.
119. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
120. LMA - Laminating Materials Association; (See CPA).
121. LPI - Lightning Protection Institute; www.lightning.org.
122. MBMA - Metal Building Manufacturers Association; www.mbma.com.
123. MCA - Metal Construction Association; www.metalconstruction.org.
124. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
125. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
126. MHIA - Material Handling Industry of America; www.mhia.org.
127. MIA - Marble Institute of America; www.marble-institute.com.
128. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
129. MPI - Master Painters Institute; www.paintinfo.com.
130. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
131. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
132. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
133. NADCA - National Air Duct Cleaners Association; www.nadca.com.
134. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
135. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
136. NBI - New Buildings Institute; www.newbuildings.org.
137. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
138. NCMA - National Concrete Masonry Association; www.ncma.org.
139. NEBB - National Environmental Balancing Bureau; www.nebb.org.
140. NECA - National Electrical Contractors Association; www.necanet.org.
141. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
142. NEMA - National Electrical Manufacturers Association; www.nema.org.
143. NETA - InterNational Electrical Testing Association; www.netaworld.org.
144. NFHS - National Federation of State High School Associations; www.nfhs.org.
145. NFPA - National Fire Protection Association; www.nfpa.org.
146. NFPA - NFPA International; (See NFPA).
147. NFRC - National Fenestration Rating Council; www.nfrc.org.
148. NHLA - National Hardwood Lumber Association; .www.nhla.com.
149. NLGA - National Lumber Grades Authority; www.nlga.org.
150. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
151. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
152. NRCA - National Roofing Contractors Association; www.nrca.net.
153. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
154. NSF - NSF International; www.nsf.org.

155. NSPE - National Society of Professional Engineers; www.nspe.org.
156. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
157. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
158. NWFA - National Wood Flooring Association; www.nwfa.org.
159. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
160. PDI - Plumbing & Drainage Institute; www.pdionline.org.
161. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
162. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
163. RFCI - Resilient Floor Covering Institute; www.rfci.com.
164. RIS - Redwood Inspection Service; www.redwoodinspection.com.
165. SAE - SAE International; www.sae.org.
166. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
167. SDI - Steel Deck Institute; www.sdi.org.
168. SDI - Steel Door Institute; www.steeldoor.org.
169. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
170. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
171. SIA - Security Industry Association; www.siaonline.org.
172. SJI - Steel Joist Institute; www.steeljoist.org.
173. SMA - Screen Manufacturers Association; www.smainfo.org.
174. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
175. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
176. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
177. SPIB - Southern Pine Inspection Bureau; www.spib.org.
178. SPRI - Single Ply Roofing Industry; www.spri.org.
179. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
180. SSINA - Specialty Steel Industry of North America; www.ssina.com.
181. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
182. STI - Steel Tank Institute; www.steeltank.com.
183. SWI - Steel Window Institute; www.steelwindows.com.
184. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
185. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
186. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
187. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
188. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
189. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
190. TMS - The Masonry Society; www.masonrysociety.org.
191. TPI - Truss Plate Institute; www.tpinst.org.
192. TPI - Turfgrass Producers International; www.turfgrasssod.org.
193. TRI - Tile Roofing Institute; www.tileroofing.org.
194. UL - Underwriters Laboratories Inc.; www.ul.com.
195. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
196. USAV - USA Volleyball; www.usavolleyball.org.
197. USGBC - U.S. Green Building Council; www.usgbc.org.
198. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.

199. WASTEC - Waste Equipment Technology Association; www.wastec.org.
200. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
201. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
202. WDMA - Window & Door Manufacturers Association; www.wdma.com.
203. WI - Woodwork Institute; www.wicnet.org.
204. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
205. WWPA - Western Wood Products Association; www.wwpa.org.

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
2. Section 312319 "Dewatering" for disposal of ground water at Project site.
3. Section 321216 "Asphalt Paving" for construction and maintenance of asphalt pavement for temporary roads and paved areas.
4. Section 321313 "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

C. Water and Sewer Service from Existing System: 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.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

3. 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.

C. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste handling procedures.
5. Other dust-control measures.

1.5 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.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 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. 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.

B. 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 bases for supporting posts.

C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

D. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

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. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack and marker boards.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

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. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating 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.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each

return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures".

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 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.

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.

3.2 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. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Sanitary Facilities: Provide temporary toilets, wash 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.

E. Heating: Provide temporary heating 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. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

G. Ventilation and Humidity Control: Provide temporary ventilation 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 dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead unless otherwise indicated.

I. 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.
2. Install lighting for Project identification sign.

J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.

1. At each telephone, post a list of important telephone numbers.

a. Police and fire departments.
b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Architect's office.
f. Engineers' offices.
g. Owner's office.
h. Principal subcontractors' field and home offices.

2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
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. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."

C. 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.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

2. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

H. 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.

I. Temporary Elevator Use: See Section Section 142413 "Holeless Hydraulic Elevators" for temporary use of new elevators.

J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

K. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

L. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 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.

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 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Section 311000 "Site Clearing."

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. 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.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

G. 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 work day.

H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

J. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

1. Construct covered walkways using scaffold or shoring framing.
2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
3. Paint and maintain appearance of walkway for duration of the Work.

K. 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.

L. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

1. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.

2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
3. Insulate partitions to control noise transmission to occupied areas.
4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
5. Protect air-handling equipment.
6. Provide walk-off mats at each entrance through temporary partition.

M. 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.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to 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.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: 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 Phase: 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, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: 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 permanent HVAC system to control humidity.
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.
    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 materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 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.

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.

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. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

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SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 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 and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
5. Section 07846 "Fire-Resistive Joint Systems" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

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, 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

    a. Masonry walls.
    b. Beams.
    c. Joists.

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.

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.

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 a 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.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. 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 local utility 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 caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere 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 site surveys 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 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: 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.

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 the best possible results. 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.

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: Do not use tools or equipment that produce harmful 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 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.

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. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled 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. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. 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 minimize interruption to occupied areas.

G. 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. 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.
6. Proceed with patching after construction operations requiring cutting are complete.

H. 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. 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 minimize 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. Provide additional coats until patch blends with adjacent surfaces.

4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: 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, according to 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 according to 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 in Finished Areas: 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 015000 "Temporary Facilities and Controls" And Section 017419 "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 assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 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. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
2. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.
3. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste

management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

1.5 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed.

1.6 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste or similar. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

G. 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 according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management coordination of projects with similar requirements.

B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.8 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste or similar. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste or similar. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:

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 installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project site.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphalt Paving Removal may be completed by grinding asphalt to maximum 1 ½" size for re-use on site or break up and transport to asphalt-recycling facility.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

C. Crush concrete to maximum 1-1/2-inch size. Crushed concrete may be used as satisfactory soil for fill or subbase.

D. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

E. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

F. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

G. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

H. Carpet: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

I. Carpet Tile: Remove debris, trash, and adhesive.

1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

J. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

K. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 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. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
2. Section 017300 "Execution" for progress cleaning of Project site.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
5. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

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 Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in 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, final completion construction photographic documentation, 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 Architect. Label with manufacturer's name and model number where applicable.
5. Submit test/adjust/balance records.
6. 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. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
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, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

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. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection 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. Reinspection: 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.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "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.

B. 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. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

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, proceeding from lowest floor to highest floor.
2. Organize items applying to each space by major element, including categories for ceiling, 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. MS Excel electronic file. Architect will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, 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.

1. Bind 2 copies of warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. 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.

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. 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. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. 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.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations 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, elevator 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 if units were operated without filters during construction or that display contamination with particulate matter on inspection.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

q. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls" And Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
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. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. 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.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble one manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
b. Enable inserted reviewer comments on draft submittals.

2. 2 paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.

7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance

procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.

F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 017300 "Execution" for final property survey.
2. Section 017700 "Closeout Procedures" for general closeout procedures.
3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.

e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file or paper copy.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

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SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.

l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

a. Produce segments to present a single significant piece of equipment per segment.
b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

END OF SECTION 017900

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. General requirements for coordinating and scheduling commissioning.
2. Commissioning meetings.
3. Commissioning reports.
4. Use of test equipment, instrumentation, and tools for commissioning.
5. Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
6. Commissioning tests and commissioning test demonstration.
7. Adjusting, verifying, and documenting identified systems and assemblies.

B. Related Requirements:

1. Section 013300 "Submittal Procedures" for submittal procedures requirements for commissioning.
2. Section 017700 "Closeout Procedures" for certificate of Construction Phase Commissioning Completion submittal requirements.
3. Section 017823 "Operation and Maintenance Data" for preliminary operation and maintenance data submittal.

1.3 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests and commissioning test demonstrations.

B. Commissioning Plan: A document, prepared by Commissioning Authority, that outlines the organization, schedule, allocation of resources, and documentation requirements of commissioning.

C. Commissioning: A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities.

D. Construction Phase Commissioning Completion: The stage of completion and acceptance of commissioning when resolution of deficient conditions and issues discovered during commissioning and retesting until acceptable results are obtained has

been accomplished. Owner will establish in writing the date Construction Phase Commissioning Completion is achieved.

1. Commissioning is complete when the work specified in this Section and related Sections has been completed and accepted, including, but not limited to, the following:

    a. Completion of tests and acceptance of test results.
    b. Resolution of issues, as verified by retests performed and documented with acceptance of retest results.
    c. Comply with requirements in Section 017900 "Demonstration and Training."
    d. Completion and acceptance of submittals and reports.

E. Owner's Witness: Commissioning Authority, Owner's Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.

F. "Systems," "Assemblies," "Subsystems," "Equipment," and "Components": Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, subsystems, equipment, and components.

G. Test: Performance tests, performance test demonstrations, commissioning tests, and commissioning test demonstrations.

H. Sampling Procedures and Tables for Inspection by Attributes: As defined in ASQ Z1.4.

1.4 COMMISSIONING TEAM

A. Members Appointed by Contractor(s):

1. Commissioning Coordinator: A person or entity employed by Contractor to manage, schedule, and coordinate commissioning.
2. Project superintendent and other employees that Contractor may deem appropriate for a particular portion of the commissioning.
3. Subcontractors, installers, suppliers, and specialists that Contractor may deem appropriate for a particular portion of the commissioning.
4. Appointed team members shall have the authority to act on behalf of the entity they represent.

B. Members Appointed by Owner:

1. Commissioning authority, plus consultants that Commissioning Authority may deem appropriate for a particular portion of the commissioning.
2. Owner representative(s), facility operations and maintenance personnel, plus other employees, separate contractors, and consultants that Owner may deem appropriate for a particular portion of the commissioning.
3. Architect, plus employees and consultants that Architect may deem appropriate for a particular portion of the commissioning.

1.5 INFORMATIONAL SUBMITTALS

A. Comply with requirements in Section 013300 "Submittal Procedures" for submittal procedures general requirements for commissioning.

B. Commissioning Plan Information:

1. List of Contractor-appointed commissioning team members to include specific personnel and subcontractors to the performance of the various commissioning requirements.
2. Schedule of commissioning activities, integrated with the construction schedule. Comply with requirements in Section 013200 "Construction Progress Documentation" for construction schedule general requirements for commissioning.
3. Contractor personnel and subcontractors to participate in each test.
4. List of instrumentation required for each test to include identification of parties that will provide instrumentation for each test.

C. Commissioning schedule.

D. Two-week look-ahead schedules.

E. Commissioning Coordinator Letter of Authority:

1. Within 10 days after approval of Commissioning Coordinator qualifications, submit a letter of authority for Commissioning Coordinator, signed by a principal of Contractor's firm. Letter shall authorize Commissioning Coordinator to do the following:

    a. Make inspections required for commissioning.
    b. Coordinate, schedule, and manage commissioning of Contractor, subcontractors, and suppliers.
    c. Obtain documentation required for commissioning from Contractor, subcontractors, and suppliers.
    d. Report issues, delayed resolution of issues, schedule conflicts, and lack of cooperation or expertise on the part of members of the commissioning team.

F. Commissioning Coordinator Qualification Data: For entity coordinating Contractor's commissioning activities to demonstrate their capabilities and experience.

1. Experienced: When used with an entity or individual, "experienced" 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.

G. List test instrumentation, equipment, and monitoring devices. Include the following information:

1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
2. Brief description of intended use.

3. Calibration record showing the following:

    a. Calibration agency, including name and contact information.
    b. Last date of calibration.
    c. Range of values for which calibration is valid.
    d. Certification of accuracy.
    e. N.I.S.T. traceability certification for calibration equipment.
    f. Due date of the next calibration.

H. Test Reports:

1. Pre-Startup Report: Prior to start up of equipment or a system, submit signed, completed construction checklists.
2. Test Data Reports: At the end of each day in which tests are conducted, submit test data for tests performed.
3. Commissioning Issues Reports: Daily, at the end of each day in which tests are conducted, submit commissioning issue reports for tests for which acceptable results were not achieved.
4. Weekly Progress Report: Weekly, at the end of each week in which tests are conducted, submit a progress report.
5. Data Trend Logs: Submit data trend logs at the end of the trend log period.
6. System Alarm Logs: Daily, at the start of days following a day in which tests were performed, submit print-out of log of alarms that occurred since the last log was printed.

I. Construction Checklists:

1. Material checks.
2. Installation checks.
3. Startup procedures, where required.

1.6 CLOSEOUT SUBMITTALS

A. Commissioning Report:

1. At Construction Phase Commissioning Completion, include the following:

    a. Pre-startup reports.
    b. Approved test procedures.
    c. Test data forms, completed and signed.
    d. Progress reports.
    e. Commissioning issues report log.
    f. Commissioning issues reports showing resolution of issues.
    g. Correspondence or other documents related to resolution of issues.
    h. Other reports required by commissioning.
    i. List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction Phase Commissioning Completion.
    j. Report shall include commissioning work of Contractor.

B. Request for Certificate of Construction Phase Commissioning Completion.

C. Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Commissioning Coordinator Qualifications:

1. Documented experience commissioning systems of similar complexity to those contained in these documents on at least three projects of similar scope and complexity.

B. Calibration Agency Qualifications: Certified by The American Association of Laboratory Accreditation that the calibration agency complies with minimum requirements of ISO/IEC 17025.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Test equipment and instrumentation required to perform the commissioning shall remain the property of Contractor unless otherwise indicated.

B. Test equipment and instrumentation required to perform commissioning shall comply with the following criteria:

1. Be manufactured for the purpose of testing and measuring tests for which they are being used and have an accuracy to test and measure system performance within the tolerances required to determine acceptable performance.
2. Calibrated and certified.

    a. Calibration performed and documented by a qualified calibration agency according to national standards applicable to the tools and instrumentation being calibrated. Calibration shall be current according to national standards or within test equipment and instrumentation manufacturer's recommended intervals, whichever is more frequent, but not less than within six months of initial use on Project. Calibration tags permanently affixed.
    b. Repair and recalibrate test equipment and instrumentation if dismantled, dropped, or damaged since last calibrated.

3. Maintain test equipment and instrumentation.
4. Use test equipment and instrumentation only for testing or monitoring Work for which they are designed.

2.2 PROPRIETARY TEST EQUIPMENT, INSTRUMENTATION, AND TOOLS

A. Proprietary test equipment, instrumentation, and tools are those manufactured or prescribed by tested equipment manufacturer and required for work on its equipment as a condition of equipment warranty, or as otherwise required to service, repair, adjust, calibrate, or perform work on its equipment.

1. Identify proprietary test equipment, instrumentation, and tools required in the test equipment identification list submittal.
2. Proprietary test equipment, instrumentation, and tools shall become the property of Owner at Substantial Completion.

2.3 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Bind report in three-ring binders (2).
2. Label the front cover and spine of each binder with the report title, volume number, project name, Contractor's name, and date of report.
3. Record report on compact disk (1).
4. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include a table of contents and an index to each test.
2. Include major tabs for each Specification Section.
3. Include minor tabs for each test.
4. Within each minor tab, include the following:

    a. Test specification.
    b. Pre-startup reports.
    c. Approved test procedures.
    d. Test data forms, completed and signed.
    e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 PREPARATION

A. Review preliminary construction checklists and preliminary test procedures and data forms.

3.2 CONSTRUCTION CHECKLISTS

A. Construction checklists cannot modify or conflict with the Contract Documents.

B. Create construction checklists based on actual systems and equipment to be included in Project.

C. Material Checks: Compare specified characteristics and approved submittals with materials as received. Include factory tests and other evaluations, adjustments, and tests performed prior to shipment, if applicable.

1. Services connection requirements, including configuration, size, location, and other pertinent characteristics.
2. Included optional features.
3. Delivery Receipt Check: Inspect and record physical condition of materials and equipment on delivery to Project site, including agreement with approved submittals, cleanliness and lack of damage.
4. Installation Checks:

    a. Location according to Drawings and approved Shop Drawings.
    b. Configuration.
    c. Compliance with manufacturers' written installation instructions.
    d. Attachment to structure.
    e. Access clearance to allow for maintenance, service, repair, removal, and replacement without the need to disassemble or remove other equipment or building elements. Access coordinated with other building elements and equipment, including, but not limited to, ceiling and wall access panels, in a manner consistent with OSHA fall-protection regulations and safe work practices.
    f. Utility connections are of the correct characteristics, as applicable.
    g. Correct labeling and identification.
    h. Startup Checks: Verify readiness of equipment to be energized. Include manufacturer's standard startup procedures and forms.

D. Startup: Perform and document initial operation of equipment to prove that it is installed properly and operates as intended according to manufacturer's standard startup procedures, minimum. Include manufacturer’s representative at startup of all equipment and documentation of manufacturer’s acceptance of installation.

E. Performance Tests:

1. Static Tests: As specified elsewhere, including, but not limited to, duct and pipe leakage tests, insulation-resistance tests, and water-penetration tests.
2. Component Performance Tests: Tests evaluate the performance of an input or output of components under a full range of operating conditions.
3. Equipment and Assembly Performance Tests: Test and evaluate performance of equipment and assemblies under a full range of operating conditions and loads.
4. System Performance Tests: Test and evaluate performance of systems under a full range of operating conditions and loads.
5. Intersystem Performance Tests: Test and evaluate the interface of different systems under a full range of operating conditions and loads.

3.3 GENERAL EXECUTION REQUIREMENTS

A. Schedule and coordinate commissioning with the construction schedule.

B. Perform activities identified in construction checklists, including tests, and document results of actions as construction proceeds.

C. Perform test demonstrations for Owner's witness. Unless otherwise indicated, demonstrate tests for 100 percent of work to which the test applies. In some instances, demonstration of a random sample of other than 100 percent of the results of a test is specified.

D. Report test data and commissioning issue resolutions.

E. Schedule personnel to participate in and perform Commissioning-Process Work.

F. Installing contractors' commissioning responsibilities include, but are not limited to, the following:

1. Operating the equipment and systems they install during tests.
2. In addition, installing contractors may be required to assist in tests of equipment and systems with which their work interfaces.

3.4 COMMISSIONING COORDINATOR RESPONSIBILITIES

A. Management and Coordination: Manage, schedule, and coordinate commissioning, including, but not limited to, the following:

1. Coordinate with subcontractors on their commissioning responsibilities and activities.
2. Obtain, assemble, and submit commissioning documentation.
3. Conduct periodic on-site commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."
4. Develop and maintain the commissioning schedule. Integrate commissioning schedule into the construction schedule. Update schedule at specified intervals.
5. Review and comment on preliminary test procedures and data forms.
6. Report inconsistencies and issues in system operations.
7. Verify that tests have been completed and results comply with acceptance criteria, and that equipment and systems are ready before scheduling test demonstrations.
8. Direct and coordinate test demonstrations.
9. Coordinate witnessing of test demonstrations by Owner's witness.
10. Coordinate and manage training. Be present during training sessions to direct video recording, present training and direct the training presentations of others. Comply with requirements in Section 017900 "Demonstration and Training."
11. Prepare and submit specified commissioning reports.
12. Track commissioning issues until resolution and retesting is successfully completed.
13. Retain original records of Commissioning-Process Work, organized as required for the commissioning report. Provide Owner's representative access to these records on request.
14. Assemble and submit commissioning report.

3.5 COMMISSIONING TESTING

A. Quality Control: Construction checklists, including tests, are quality-control tools designed to improve the functional quality of Project. Test demonstrations evaluate the effectiveness of Contractor's quality-control process.

B. Owner's witness and manufacturer’s representative will be present to witness commissioning work requiring the signature of an owner's witness, including, but not limited to, test demonstrations. Owner's project manager will coordinate attendance by Owner's witness with Contractor's published commissioning schedule. Owner's witness will provide no labor or materials in the commissioning work. The only function of Owner's witness will be to observe and comment on the progress and results of commissioning.

C. Installation Compliance Issues: Record as an installation compliance issue Work found to be incomplete, inaccessible, at variance with the Contract Documents, nonfunctional, or that does not comply with construction checklists. Record installation compliance issues on the construction checklist at the time they are identified. Record corrective action and how future Work should be modified before signing off the construction checklist.

D. Pre-Startup Audit: Prior to executing startup procedures, review completed installation checks to determine readiness for startup and operation. Report conditions, which, if left uncorrected, adversely impact the ability of systems or equipment to operate satisfactorily or to comply with acceptance criteria. Prepare pre-startup report for each system.

E. Test Procedures and Test Data Forms:

1. Test procedures shall define the step-by-step procedures to be used to execute tests and test demonstrations.
2. Test procedures shall be specific to the make, model, and application of the equipment and systems being tested.
3. Completed test data forms are the official records of the results of tests.
4. Commissioning Authority will provide to Contractor preliminary test procedures and test data forms for performance tests and commissioning tests after approval of Product Data, Shop Drawings, and preliminary operation and maintenance manual.
5. Review preliminary test procedures and test data forms and provide comments within 14 days of receipt from Commissioning Authority. Review shall address the following:

    a. Equipment protection and warranty issues, including, but not limited to, manufacturers' installation and startup recommendations, and operation and maintenance instructions.
    b. Applicability of the procedure to the specific software, equipment, and systems approved for installation.

6. After Contractor has reviewed and commented on the preliminary test procedures and test data forms, Commissioning Authority will revise and reissue the approved revised test procedures and test data forms marked "Approved for Testing."
7. Use only approved test procedures and test data forms marked "Approved for Testing" to perform and document tests and test demonstrations.

F. Performance of Tests:

1. The sampling rate for tests is 100 percent. The sampling rate for test demonstrations is 100 percent unless otherwise indicated.
2. Perform and complete each step of the approved test procedures in the order listed.
3. Record data observed during performance of tests on approved data forms at the time of test performance and when the results are observed.
4. Record test results that are not within the range of acceptable results on commissioning issue report forms in addition to recording the results on approved test procedures and data forms according to the "Commissioning Compliance Issues" Paragraph in this Article.
5. On completion of a test, sign the completed test procedure and data form. Tests for which test procedures and data forms are incomplete, not signed, or which indicate performance that does not comply with acceptance criteria will be rejected. Tests for which test procedures and data forms are rejected shall be repeated and results resubmitted.

G. Performance of Test Demonstration:

1. Perform test demonstrations on a sample of tests after test data submittals are approved. The sampling rate for test demonstrations shall be 100 percent unless otherwise indicated in the individual test specification.
2. Notify Owner's witness at least three days in advance of each test demonstration.
3. Perform and complete each step of the approved test procedures in the order listed.
4. Record data observed during performance of test demonstrations on approved data forms at the time of demonstration and when the results are observed.
5. Provide full access to Owner's witness to directly observe the performance of all aspects of system response during the test demonstration. On completion of a test demonstration, sign the completed data form and obtain signature of Owner's witness at the time of the test to authenticate the reported results.
6. Test demonstration data forms not signed by Contractor and Owner's witness at the time of the completion of the procedure will be rejected. Test demonstrations for which data forms are rejected shall be repeated and results shall be resubmitted.

    a. Exception for Failure of Owner's Witness to Attend: Failure of Owner's witness to be present for agreed-on schedule of test demonstration shall not delay Contractor. If Owner's witness fails to attend a scheduled test, Contractor shall proceed with the scheduled test. On completion, Contractor shall sign the data form for Contractor and for Owner's witness, and shall note the absence of Owner's witness at the scheduled time and place.

7. False load test requirements are specified in related sections.

    a. Where false load testing is specified, provide temporary equipment, power, controls, wiring, piping, valves, and other necessary equipment and connections required to apply the specified load to the system. False load system shall be capable of steady-state operation and modulation at the level of load specified. Equipment and systems permanently installed

in this work shall not be used to create the false load without Architect's written approval.

H. Deferred Tests:

1. Deferred Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed deferred tests or other tests approved for deferral until specified seasonal or other conditions are available. When approved, deferred tests may be completed after the date of Construction Phase Commissioning Completion. Identify proposed deferred tests in the request for Certificate of Construction Phase Commissioning Completion as follows:

    a. Identify deferred tests by number and title.
    b. Provide a target schedule for completion of deferred tests.

2. Schedule and coordinate deferred tests. Schedule deferred tests when specified conditions are available. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where deferred tests are specified, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule deferred tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

I. Delayed Tests:

1. Delayed Tests List: Identify, in the request for Certificate of Construction Phase Commissioning Completion, proposed delayed tests. Obtain Owner approval of proposed delayed tests, including proposed schedule of completion of each delayed test, before submitting request for Certificate of Construction Phase Commissioning Completion. Include the following in the request for Certificate of Construction Phase Commissioning Completion:

    a. Identify delayed tests by test number and title.
    b. Written approval of proposed delayed tests, including approved schedule of completion of delayed tests.

2. Schedule and coordinate delayed tests. Schedule delayed tests when conditions that caused the delay have been rectified. Notify Architect and Commissioning Authority at least three working days (minimum) in advance of tests.
3. Where delayed tests are approved, coordinate participation of necessary personnel and of Architect, Commissioning Authority, and Owner's witness. Schedule delayed tests to minimize occupant and facility impact. Obtain Architect's approval of the proposed schedule.

J. Commissioning Compliance Issues:

1. Test results that are not within the range of acceptable results are commissioning compliance issues.
2. Track and report commissioning compliance issues until resolution and retesting are successfully completed.

3. If a test demonstration fails, determine the cause of failure. Direct timely resolution of issue and then repeat the demonstration. If a test demonstration must be repeated due to failure caused by Contractor work or materials, reimburse Owner for billed costs for the participation in the repeated demonstration.
4. Test Results: If a test demonstration fails to meet the acceptance criteria, perform the following:

    a. Complete a commissioning compliance issue report form promptly on discovery of test results that do not comply with acceptance criteria.
    b. Submit commissioning compliance issue report form within 24 hours of the test.
    c. Determine the cause of the failure.
    d. Establish responsibility for corrective action if the failure is due to conditions found to be Contractor's responsibility.

5. Commissioning Compliance Issue Report: Provide a commissioning compliance issue report for each issue. Do not report multiple issues on the same commissioning compliance issue report.

    a. Exception: If an entire class of devices is determined to exhibit the identical issue, they may be reported on a single commissioning compliance issue report. (For example, if all return-air damper actuators that are specified to fail to the open position are found to fail to the closed position, they may be reported on a single commissioning issue report. If a single commissioning issue report is used for multiple commissioning compliance issues, each device shall be identified in the report, and the total number of devices at issue shall be identified.
    b. Complete and submit Part 1 of the commissioning compliance issue report immediately when the condition is observed.
    c. Record the commissioning compliance issue report number and describe the deficient condition on the data form.
    d. Resolve commissioning compliance issues promptly. Complete and submit Part 2 of the commissioning compliance issue report when issues are resolved.

6. Diagnose and correct failed test demonstrations as follows:

    a. Perform diagnostic tests and activities required to determine the fundamental cause of issues observed.
    b. Record each step of the diagnostic procedure prior to performing the procedure. Update written procedure as changes become necessary.
    c. Record the results of each step of the diagnostic procedure.
    d. Record the conclusion of the diagnostic procedure on the fundamental cause of the issue.
    e. Determine and record corrective measures.
    f. Include diagnosis of fundamental cause of issues in commissioning compliance issue report.

7. Retest:

a. Schedule and repeat the complete test procedure for each test demonstration for which acceptable results are not achieved. Obtain signature of Owner's witness on retest data forms. Repeat test demonstration until acceptable results are achieved. Except for issues that are determined to result from design errors or omissions, or other conditions beyond Contractor's responsibility, compensate Owner for direct costs incurred as the result of repeated test demonstrations to achieve acceptable results.
b. For each repeated test demonstration, submit a new test data form, marked "Retest."

8. Do not correct commissioning compliance issues during test demonstrations.

a. Exceptions will be allowed if the cause of the issue is obvious and resolution can be completed in less than five minutes. If corrections are made under this exception, note the deficient conditions on the test data form and issue a commissioning compliance issue report. A new test data form, marked "Retest," shall be initiated after the resolution has been completed.

3.6 COMMISSIONING MEETINGS

A. Schedule and conduct commissioning meetings. Comply with requirements in Section 013100 "Project Management and Coordination."

3.7 SEQUENCING

A. Sequencing of Commissioning Verification Activities: For a particular material, item of equipment, assembly, or system, perform the following in the order listed unless otherwise indicated:

1. Construction Checklists:

a. Material checks.
b. Installation checks.
c. Start up, as appropriate. Some startup may depend on component performance. Such startup may follow component performance tests on which the startup depends.
d. Performance Tests:

1) Static tests, as appropriate.
2) Component performance tests. Some component performance tests may depend on completion of startup. Such component performance tests may follow startup.
3) Equipment and assembly performance tests.
4) System performance tests.
5) Intersystem performance tests.

2. Commissioning tests.

B. Before performing commissioning tests, verify that materials, equipment, assemblies, and systems are delivered, installed, started, and adjusted to perform according to construction checklists.

C. Verify readiness of materials, equipment, assemblies, and systems by performing tests prior to performing test demonstrations. Notify Architect if acceptable results cannot be achieved due to conditions beyond Contractor's control or responsibility.

D. Commence tests as soon as installation checks for materials, equipment, assemblies, or systems are satisfactorily completed. Tests of a particular system may proceed prior to completion of other systems, provided the incomplete work does not interfere with successful execution of test.

3.8 SCHEDULING

A. Commence commissioning as early in the construction period as possible.

B. Commissioning Schedule: Integrate commissioning into Contractor's construction schedule. See Section 013200 "Construction Progress Documentation."

1. Include detailed commissioning activities in monthly updated Contractor's construction schedule and short interval schedule submittals.
2. Schedule the start date and duration for the following commissioning activities:

    a. Submittals.
    b. Preliminary operation and maintenance manual submittals.
    c. Installation checks.
    d. Startup, where required.
    e. Performance tests.
    f. Performance test demonstrations.
    g. Commissioning tests.
    h. Commissioning test demonstrations.

3. Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
4. Determine milestones and prerequisites for commissioning. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short interval schedule submittals.

C. Two-Week Look-Ahead Commissioning Schedule:

1. Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning.
2. Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
3. Use two-week look-ahead schedules to notify and coordinate participation of Owner's witnesses.

D. Owner's Witness Coordination:

1. Coordinate Owner's witness participation via Architect.
2. Notify Architect of commissioning schedule changes at least two work days in advance for activities requiring the participation of Owner's witness.

3.9 COMMISSIONING REPORTS

A. Test Reports:

1. Pre-startup reports include observations of the conditions of installation, organized into the following sections:

    a. Equipment Model Verification: Compare contract requirements, approved submittals, and provided equipment. Note inconsistencies.
    b. Preinstallation Physical Condition Checks: Observe physical condition of equipment prior to installation. Note conditions including, but not limited to, physical damage, corrosion, water damage, or other contamination or dirt.
    c. Preinstallation Component Verification Checks: Verify components supplied with the equipment, preinstalled or field installed, are correctly installed and functional. Verify external components required for proper operation of equipment correctly installed and functional. Note missing, improperly configured, improperly installed, or nonfunctional components.
    d. Summary of Installation Compliance Issues and Corrective Actions: Identify installation compliance issues and the corrective actions for each. Verify that issues noted have been corrected.
    e. Evaluation of System Readiness for Startup: For each item of equipment for each system for which startup is anticipated, document in summary form acceptable to Owner completion of equipment model verification, preinstallation physical condition checks, preinstallation component verification checks, and completion of corrective actions for installation compliance issues.

2. Test data reports include the following:

    a. "As-tested" system configuration. Complete record of conditions under which the test was performed, including, but not limited to, the status of equipment, systems, and assemblies; temporary adjustments and settings; and ambient conditions.
    b. Data and observations, including, but not limited to, data trend logs, recorded during the tests.
    c. Signatures of individuals performing and witnessing tests.
    d. Data trend logs accumulated overnight from the previous day of testing.

3. Commissioning Compliance Issues Reports: Report as commissioning compliance issues results of tests and test demonstrations that do not comply with acceptance criteria. Report only one issue per commissioning compliance issue report. Use sequentially numbered facsimiles of commissioning compliance issue report form included in this Section, or other form approved by Owner. Distribute commissioning compliance issue reports to parties responsible for taking corrective action. Identify the following:

a. Commissioning compliance issue report number. Assign unique, sequential numbers to individual commissioning compliance issue reports when they are created, to be used for tracking.
b. Action distribution list.
c. Report date.
d. Test number and description.
e. Equipment identification and location.
f. Briefly describe observations about the performance associated with failure to achieve acceptable results. Identify the cause of failure if apparent.
g. Diagnostic procedure or plan to determine the cause (include in initial submittal).
h. Diagnosis of fundamental cause of issues as specified below (include in resubmittal).
i. Fundamental cause of unacceptable performance as determined by diagnostic tests and activities.
j. When issues have been resolved, update and resubmit the commissioning issue report forms by completing Part 2. Identify resolution taken and the dates and initials of the persons making the entries.
k. Schedule for retesting.

4. Weekly progress reports include information for tests conducted since the preceding report and the following:

a. Completed data forms.
b. Equipment or system tested, including test number, system or equipment tag number and location, and notation about the apparent acceptability of results.
c. Activities scheduled but not conducted per schedule.
d. Commissioning compliance issue report log.
e. Schedule changes for remaining Commissioning-Process Work, if any.

5. Data trend logs shall be initiated and running prior to the time scheduled for the test demonstration.

a. Trend log data format shall be multiple data series graphs. Where multiple data series are trend logged concurrently, present the data on a common horizontal time axis. Individual data series may be presented on a segmented vertical axis to avoid interference of one data series with another, and to accommodate different axis scale values. Graphs shall be sufficiently clear to interpret data within the accuracy required by the acceptance criteria.
b. Attach to the data form printed trend log data collected during the test or test demonstration.
c. Record, print out, and attach to the data form operator activity during the time the trend log is running. During the time the trend log is running, operator intervention not directed by the test procedure invalidates the test results.

6. System Alarm Logs: Record and print out a log of alarms that occurred since the last log was printed. Evaluate alarms to determine if the previous day's work resulted in any conditions that are not considered "normal operation."

   a. Conditions that are not considered "normal operation" shall be reported on a commissioning issue report attached to the alarm log. Resolve as necessary. The intent of this requirement is to discover control system points or sequences left in manual or disabled conditions, equipment left disconnected, set points left with abnormal values, or similar conditions that may have resulted from failure to fully restore systems to normal, automatic control after test completion.

3.10 CERTIFICATE OF CONSTRUCTION PHASE COMMISSIONING COMPLETION

A. When Contractor considers that construction phase commissioning, or a portion thereof which Owner agrees to accept separately, is complete, Contractor shall prepare and submit to Owner and Commissioning Authority through Architect a comprehensive list of items to be completed or corrected. Failure to include an item on such list does not alter Contractor's responsibility to compete commissioning.

B. On receipt of Contractor's list, Commissioning Authority will make an inspection to determine whether the construction phase commissioning or designated portion thereof is complete. If Commissioning Authority's inspection discloses items, whether included on Contractor's list, which is not sufficiently complete as defined in "Construction Phase Commissioning Completion" Paragraph in the "Definitions" Article, Contractor shall, before issuance of the Certificate of Construction Phase Completion, complete or correct such items on notification by Commissioning Authority. In such case, Contractor shall then submit a request for another inspection by Commissioning Authority to determine construction phase commissioning completion.

C. Contractor shall promptly correct deficient conditions and issues discovered during commissioning. Costs of correcting such deficient conditions and issues, including additional testing and inspections, the cost of uncovering and replacement, and compensation for Architect's and Commissioning Authority's services and expenses made necessary thereby, shall be at Contractor's expense.

D. When construction phase commissioning or designated portion is complete, Commissioning Authority will prepare a Certificate of Construction Phase Commissioning that shall establish the date of completion of construction phase commissioning. Certificate of Construction Phase Commissioning Completion shall be submitted prior to requesting inspection for determining date of Substantial Completion.

END OF SECTION 019113

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SECTION 024116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of buildings and site improvements.
2. Removing below-grade construction.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

1.3 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

1.5 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If 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.

E. On-site storage or sale of removed items or materials is not permitted.

1.6 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting 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. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.

1. Owner will arrange to shut off utilities when requested by Contractor.
2. Arrange to shut off utilities with utility companies.
3. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
4. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
5. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated.

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

A. General: Demolish indicated buildings completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain adequate ventilation when using cutting torches.
3. Locate building 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 building 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.

C. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.

D. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.

3.6 SITE RESTORATION

A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades. Provide finish materials as noted on the drawings.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site in accordance with the City of Madison Guidelines.

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.

B. Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected site elements.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

A. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

B. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 PREDEMOLITION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Predemolition Photographs or Video: Submit before Work begins.

C. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.

1.5 CLOSEOUT SUBMITTALS

A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.7 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Contracting Officer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.

2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Contracting Officer.

D. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems not indicated for removal and protect them against damage.

B. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. 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 access and protection specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

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.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Contracting Officer, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

A. 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.

B. Cleanly, full-depth saw cut asphalt pavement and concrete sidewalk at limits of removal.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

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 according to 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.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.

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.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them according to The City of Madison Guidelines.

3.7 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 024119

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SECTION 033100 - STRUCTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural Concrete.
2. Admixtures.
3. Curing and Treatment Requirements.
4. Floor flatness and levelness.
5. Formwork, shoring, bracing, and anchorage.
6. Concrete reinforcement and accessories.

B. Work Installed But Furnished Under Other Sections:

1. Division 04 - Masonry: Masonry accessories attached to formwork.
2. Division 05 - Metals: Metal fabrications attached to formwork.

C. Related Sections:

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Section 03 41 13 - Precast Concrete Hollow Core Planks.
3. Division 31 – Earthwork.

1.2 REFERENCES

A. Incorporated Guides and References

1. American Concrete Institute (ACI):

a. ACI 302.1R – Guide for Concrete Floor and Slab Construction.
b. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.
c. ACI 304.2R - Placing Concrete by Pumping Methods.
d. ACI 305R - Hot Weather Concreting.
e. ACI 309R – Guide for the Consolidation of Concrete.
f. ACI 347 – Guide to Formwork for Concrete.
g. ACI SP-66 – ACI Detailing Manual.

B. Specifications

1. American Concrete Institute (ACI):

a. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.
b. ACI 301 - Specifications for Structural Concrete.
c. ACI 303.1 – Specification for Cast-In-Place Architectural Concrete.
d. ACI 306.1 – Specification for Cold Weather Concreting.

e. ACI 308.1 – Specification for Curing Concrete.
f. ACI 315 - Details and Detailing of Concrete Reinforcement.
g. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

2. ASTM International (ASTM):

a. ASTM A185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
b. ASTM A497 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
c. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
d. ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
e. ASTM C33 – Standard Specification for Concrete Aggregates.
f. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
g. ASTM C150 – Standard Specification for Portland Cement.
h. ASTM C156 – Standard Test Method for Water Loss (From a Mortar Speciman) Through Liquid Membrane-Forming Curing Compounds for Concrete.
i. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
j. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
k. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
l. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
m. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete.
n. ASTM C989 – Standard Specification for Slag Cement for Use in Concrete and Mortars.
o. ASTM C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
p. ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.
q. ASTM C1602 – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
r. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
s. ASTM E1155 – Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.
t. ASTM E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
u. ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

1.3 SUBMITTALS

A. Submit proposed mix design of each class of concrete to Engineer not later than 10 days after Notice to Proceed or 15 days prior to the first concrete placement, whichever comes first.

B. Submit shop drawings of reinforcing steel under provisions of Division 01 – General Requirements.

1. Initial submittal of reinforcement shop drawings shall be complete. No partial submittals will be accepted.
2. Indicate reinforcement sizes, spacings, locations and quantities of reinforcing steel, and wire reinforcement, bending and cutting schedules, splicing, supporting and spacing devices.
3. Reinforcement placement shop drawings for foundations and walls shall conform to ACI SP-66 providing full wall elevations.

C. Material Certificates: For each of the following, signed by the manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Waterstops.
4. Curing compounds.
5. Bonding agents.
6. Vapor retarders.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates.

E. Control Joint Plan: Submit Control Joint Location Plan.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301, 305R, and 306.1.

B. Maintain copy of ACI 301 on site.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of local, state and federal rules and regulations applicable to Work and Project location.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Concreting

1. Placement and curing of concrete where (1) average daily temperature for three consecutive days is less than 40 degrees F, and (2) air temperature is not greater than 50 degrees F for more than one-half of a 24-hour period from midnight to midnight shall be in accordance with ACI 306.1.

B. Hot Weather Concreting

1. Placement and curing of concrete subject to a combination of (1) rising air temperature (generally greater than 75 degrees F) and (2) wind and low relative humidity shall be in accordance with ACI 305R.
2. Contractor shall provide plan for minimizing exposure of concrete to adverse conditions due to combinations of high air temperature, direct sunlight, drying winds, and high concrete temperature.
3. Protect concrete from rapid temperature drop.
4. Pre-wet subgrade and forms.

1.7 SLAB PRE-CONSTRUCTION MEETING

A. At least 20 days prior to placing first concrete floor slab, Contractor shall hold a meeting to review detailed requirements for preparing final concrete design mixes and to establish procedures for placing, finishing, curing, and protecting concrete to meet required quality under anticipated conditions.

B. Contractor shall request responsible representatives of each party concerned with concrete work to attend a meeting, including but not limited to the following:

1. Contractor's Superintendent.
2. Structural Engineer.
3. Testing Laboratory responsible for field quality control.
4. Concrete Subcontractor’s Project Manager.
5. Ready-mix Concrete Supplier.
6. Architect.

C. Minutes of the meeting shall be recorded, typed, reproduced and distributed by Contractor to all parties concerned within five working days of meeting.

D. Minutes shall include a statement by admixture manufacturer(s) indicating that proposed mix design and placing can produce concrete quality required by this Section.

E. Contractor shall notify Structural Engineer and Architect at least 10 days prior to scheduled date of meeting.

F. During construction, additional meetings may be held to review and modify procedures and materials established to assure attainment of required quality level.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Plywood Forms: Douglas Fir or Spruce-Pine-Fir species: Sound, undamaged sheets with clean true edges, exterior glue, facing material to provide finish specified.

B. Lumber: Douglas Fir or Spruce species; construction grade or better; with grade stamp clearly visible.

C. Preformed Steel Wall Forms: Minimum 16 gage thick, Vertically and horizontally matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and surface appearance.

D. Tubular Column Type: Round, spirally wound laminated fiber material; inside surface treated with release agent.

E. Form Ties For Exposed Surfaces: Plastic cone snap ties with 1-inch outside diameter by 1-inch (nominal) long cones, with no metal within 1-inch of concrete face after removal;

1. Manufacturers:

a. Advance Concrete Formwork, Inc.
b. Dayton Superior.
c. Symons - A Dayton Superior Company.
d. Williams Form Engineering Corporation.
e. Substitutions: As approved by Engineer.

F. Form Ties For Hidden Surfaces: Metal spreader type, removable to a depth of 1-inch from concrete face;

1. Manufacturers:

a. Advance Concrete Formwork, Inc.
b. Dayton Superior.
c. Williams Form Engineering Corporation.
d. Substitutions: As approved by Engineer.

2. Contractor shall use formwork, form components and accessories provided by a single manufacturer. Intermixing of formwork, components and accessories shall not be allowed.

2.2 REINFORCING STEEL

A. Reinforcing Steel: ASTM A615, 60 ksi yield grade carbon steel deformed bars; uncoated, finish. Reinforcing bars to be welded shall conform to ASTM A706.

B. Welded Steel Wire Reinforcement: Plain type, ASTM A185; Deformed type, ASTM A497; in flat sheets; coiled rolls; uncoated, finish.

C. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete.

2.3 FIBER REINFORCEMENT

A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete, complying with ASTM C1116, Type III, 1/2 to 1-1/2 inches long.

1. Manufacturers - Fibrillated Fibers:

    a. Axim Italcementi Group - Fibrasol F.
    b. Forta Corporation - Forta Super-Net.
    c. Propex Concrete Systems Corporation - Fibermesh 300.
    d. W.R. Grace & Co., Construction Products Division - Grace Fibers.
    e. Substitutions: As approved by Architect/Engineer.

B. Synthetic Macro Fibers: Synthetic macro fibers engineered and designed for use in concrete, complying with ASTM C1116, Type III.

1. Manufacturers – Macro Fibers:

    a. The Euclid Chemical Company - TUF-STRAND SF
    b. Propex Concrete Systems Corporation - Fibermesh 650
    c. W. R. Grace & Co., Construction Products Division - STRUX 90/40
    d. Substitutions: As approved by Architect/Engineer.

2.4 CONCRETE MATERIALS

A. Cementitious Materials

1. Portland Cement: ASTM C150, [gray] [white] color, Type I or II except as specified below.
2. Fly Ash: ASTM C618, Class C or F.
3. Ground Granulated Blast Furnace Slag: ASTM C989, Grade 100 or 120.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: ASTM C1602, clean and not detrimental to concrete.

2.5 ADMIXTURES

A. Admixtures to be used in the concrete mixture shall be submitted to the Engineer for approval as part of the mixture design.

B. Chemical admixtures shall be in accordance with ASTM C494.

C. Admixtures shall be used in accordance with manufacturer's written recommendations.

D. Admixtures containing chlorides, sulfides, or nitrides are not permitted.

E. Admixtures permitted shall be supplied by a single manufacturer for project.

F. Air Entrainment Admixture: ASTM C260;

1. Manufacturers:

a. Axim Italcementi Group.
b. BASF Admixtures, Inc.
c. Grace Construction Products.
d. The Euclid Chemical Company
e. Substitutions: As approved by Engineer.

2.6 ACCESSORIES

A. Vapor Retarder: ASTM E1745; Class C, 10 mil minimum thickness, water vapor permeance rating of 0.050 perms or less;

1. Manufacturers:

a. Americover - Vapor Block VB 10.
b. Fortifiber - Moistop Ultra 10
c. Stego Industries - Stego Wrap 10-mil
d. W.R. Meadows - Perminator.
e. Substitutions: As approved by Architect/Engineer.

B. Non-Shrink Grout: Premixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 2400 psi.

C. Waterstops: Cold Joint Type;

1. Manufacturers:

a. Cetco - Waterstop RX.
b. Greenstreak Group, Inc. - Swellstop Waterstop
c. JP Specialties, Inc. - Type 20 & 23
d. Substitutions: As approved by Architect/Engineer.

D. Joint Filler: ASTM D1751, Bituminous fiber, 1/2-inch wide by depth of concrete less 1/8-inch.

E. Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating, intended for use on concrete;

1. Manufacturers:

a. BASF Construction Chemicals, LLC - Building Systems: Castoff
b. Dayton Superior - Clean Strip Ultra (J-3).
c. W.R. Meadows - Duogard.

d. Substitutions: As approved by Architect/Engineer.

2.7 CURING AND TREATMENT MATERIALS

A. Water: Potable and clean.

B. Evaporation Reducer: Thin monomolecular film to reduce rapid moisture loss from the concrete surfaces prior to curing;

1. Manufacturers:

a. BASF Admixtures, Inc. - Master Builders - Confilm.
b. Dayton Superior - Sure Film J-74
c. W.R. Meadows - Evapre.
d. Substitutions: As approved by Architect/Engineer.

C. Curing Compound (Dissipating Type): ASTM C309, Type I, free of oil, wax, or grease;

1. Manufacturers:

a. Dayton Superior - Day-Chem Rez Cure (J-11-W).
b. The Euclid Chemical Company - Kurez DR VOX.
c. W.R. Meadows -Sealtight 1100 - Clear .
d. Substitutions: As approved by Architect/Engineer.

D. Curing and Sealing Compound: ASTM C309; Type I free of oil, wax, or grease;

1. Manufacturers:

a. BASF Building Systems, Inc. - Sonneborn Kure-N-Seal WB.
b. Dayton Superior - Safe Cure & Seal (J-18).
c. The Euclid Chemical Company - Aqua-Cure VOX
d. W. R. Meadows - Sealtight - VOCOMP-20.
e. Substitutions: As approved by Architect/Engineer.

2. Hardeners and sealer used shall be of same manufacturer.

E. Sealers: ASTM C309, Type 1, Class A and B; ASTM C1315, Type 1, Class A; Type I free of oil, wax, or grease;

1. Manufacturers:

a. Dayton Superior - Ultra Seal EF
b. The Euclid Chemical Company - Super Diamond Clear VOX.
c. W.R. Meadows - Tiah OTC
d. Substitutions: As approved by Architect/Engineer.

2. Hardeners and sealer used shall be of the same manufacturer.

F. Curing Compound (Exterior Use Only): ASTM C309; Type II white pigmented;

1. Manufacturers:

    a. ChemMasters - SafeCure 3000.
    b. Dayton Superior - Day-Chem City White Cure (J-8).
    c. W. R. Meadows - 1200 White Series.
    d. Substitutions: As approved by Architect/Engineer.

2. Hardeners and sealer used shall be of same manufacturer.

G. Liquid Hardener and Densifiers:

1. Manufacturers:

    a. BASF Building Systems, Inc. - Sonneborn Kure-N-Harden.
    b. Dayton Superior - Day-Chem Sure Hard (J-17).
    c. The Euclid Chemical Company - Euco Diamond Hard.
    d. W.R. Meadows - Liqui-Hard.
    e. Substitutions: As approved by Architect/Engineer.

2. Hardeners and sealer used shall be of same manufacturer.

H. Shake on Hardeners – Non-Metallic, Quartz-Based:

1. Manufacturers:

    a. BASF Building Systems Inc. - Master Builders Maximent HD.
    b. Dayton Superior - Quartz Tuff.
    c. The Euclid Chemical Company - Surflex.
    d. Substitutions: As approved by Architect/Engineer.

2. Hardeners and sealer used shall be of the same manufacturer.

I. Polyethylene Film: ASTM C171, 6 mil thick, clear.

J. Burlap shall be clean, evenly woven, free of encrusted concrete or other contaminating materials, and shall be reasonably free of cuts, tears, broken or missing areas.

2.8 CONCRETE MIXTURE

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture of field test data, or both, according to ACI 301.

B. Mix concrete in accordance with ASTM C94.

C. Concrete mix designs shall be designed and submitted in accordance with Division 01 and included as part of cost of this Work.

D. Mix designs shall be prepared by a qualified agency acceptable to Architect/Engineer. Six (6) copies of mix designs shall be submitted for Architect/Engineer's review prior to placing any concrete.

E. Mix design shall indicate brands, types, and quantities of admixtures included, compressive strength, slump, sieve analysis for fine and coarse aggregate, quantities of all ingredients, type and brand of cement, source of aggregate, whether fine aggregate is natural or manufactured.

F. Design of mix shall assure placing and finishing characteristics that meet Project requirements.

G. Mix designs contained in the Schedule of Mixes may be modified and submitted to Engineer for approval, by use of mid or high range water reducing admixtures to control slumps required for pumping of concrete. Strength, placing and finishing requirements shall be maintained.

H. Concrete mixtures placed directly over vapor retarders shall be designed to have low shrinkage characteristics and designed to minimize slab curling.

I. Initial and final set times of concrete mix designs shall be coordinated between the contractor and concrete supplier.

2.9 SCHEDULE OF MIXES

A. Footings: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): 3000 psi.
2. Maximum Aggregate Size: 1-1/2 inches.
3. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent.
4. Maximum Water-Cement Ratio: 0.50.

B. Foundation Walls: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Aggregate Size: 3/4 - inch.
3. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent.

C. Interior Slab-on-Ground, Equipment Pads: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Aggregate Size: 3/4 - inch.

D. Exterior Slab-on-Ground, Walks, Paving, Curbs, Equipment Pads: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Aggregate Size: 3/4 - inch.
3. Maximum Slump (Inch): 3
4. Maximum Water-Cement Ratio: 0.50.
5. Air Entrainment: 6 percent air content is required with an acceptable air content of plus or minus 1.5 percent.

E. Stair Pans and Landings: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): 4000 psi.
2. Maximum Aggregate Size: 3/8 - inch.
3. Maximum Slump (Inch): 3
4. Maximum Water-Cement Ratio: 0.50.

F. Topping Slab: Proportion normal-weight concrete mix as follows:

1. Compressive Strength (28 Days): 3000 psi.
2. Maximum Aggregate Size: 3/4 - inch.
3. Maximum Water-Cement Ratio: 0.45.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits stated below.

C. Verify lines, levels, and measurement before proceeding with formwork.

D. Earth forms are not permitted.

E. Align form joints.

F. Do not apply form release agent where concrete surfaces receive [special finishes] [or] [applied coatings] which may be affected by agent.

G. Coordinate work of other Sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

H. Provide chamfer strips for all exposed concrete corners of formwork.

3.2 REINFORCEMENT

A. Place, support, and secure reinforcement against displacement.

B. Locate reinforcing splices as shown on Drawings.

C. Damage to rebar coating as a result of bending shall be repaired with equivalent coating.

3.3 VAPOR RETARDERS

A. Vapor retarders shall be provided where slabs will receive vapor-sensitive floor coverings or in humidity-controlled areas or as indicated on drawings.

1. Install vapor retarders directly under concrete slab-on-ground at areas with vapor-sensitive floor coverings and where subgrade granular material is subject to future moisture infiltration.
2. Where subgrade material is dry, and will not be subject to future moisture infiltration and where humidity will be controlled, place the vapor retarder beneath the dry granular material and the concrete slab-on-ground directly on the dry granular material.

B. Installation of Water Vapor Retarders shall be in accordance with ASTM E1643.

C. Edges shall be lapped 6 inches and sealed.

D. Contractor is responsible for maintaining conditions to provide a dry subgrade material where the slab is cast on top of granular material.

E. Contractor is responsible for maintaining a puncture free vapor retarder. Any punctures shall be sealed appropriately to prevent vapor transmission.

F. Do not disturb vapor retarder while placing reinforcement.

3.4 PLACING CONCRETE

A. Notify Engineer a minimum of 48 hours prior to commencement of concreting operations.

B. Failure to notify Engineer may result in rejection of concrete placed without observation.

C. Place concrete in accordance with ACI 301.

D. Place pumped concrete in accordance with ACI 304.2R. Line coating mix to initiate pumping shall not be used in pour but shall be wasted.

E. Ensure reinforcement and embedded items are not disturbed during concrete placement.

F. Concrete with excessive honeycomb or embedded debris shall be rejected and replaced at no cost to OWNER.

G. Application of surface retarders and sawcutting of joints shall be planned in advance.

H. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.

I. Placing During Hot Weather:

1. Place concrete during hot weather conditions in accordance with ACI 305R.

J. Placing During Cold Weather:

1. Place concrete during cold weather conditions in accordance with ACI 306.1.

K. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.5 FLOOR SLABS

A. Place floor slabs-on-ground with contraction and construction joints as indicated on Drawings.

B. Saw cut contraction joints as soon as possible, without raveling, after placement of concrete, but within 24 hours.

C. Cut slabs with 3/16-inch thick blade, cutting one-fourth depth of slab thickness.

D. Separate slabs on fill from vertical surfaces with a joint filler.

E. Extend joint filler from bottom of slab to within 1/8-inch of finished slab surface.

F. Floor Finishes shall be in accordance with ACI 302.1R. Immediately after finishing, begin curing.

3.6 FLOOR CURING AND TREATMENT

A. Curing shall begin promptly to prevent drying of concrete. Curing shall continue for 7 days after placing.

B. Curing methods shall not be changed until after the third day, and then only with written approval of the Engineer.

C. Do not allow concrete to cool rapidly.

D. Keep forms covered and moist during the first 3 days of the curing period.

E. Verify compatibility of floor treatment materials with mastics and finish materials to be applied to floor.

F. Where floors are to be covered, apply one coat of dissipating curing compound, applied immediately after finishing.

G. Where floors are not scheduled to be covered, apply two coats of curing and sealing compound, with first coat applied immediately after finishing and second coat just before final acceptance of building except where floor covering materials are to be applied.

H. Apply a non-slip aggregate to stair treads and landings, and ramps not scheduled to receive floor covering, in accordance with manufacturer's instructions, trowel to a hard finish, and treat surface with liquid hardener without sealer.

3.7 REPAIR OF VERTICAL SURFACE DEFECTS

A. Upon stripping of forms, vertical surfaces shall be inspected for defects caused by surface air voids, honeycombing, form tie holes, peeling, and fins.

B. Surface air voids shall be repaired with a unit packaged mixture of sand and cement mixed on job site with water and a unit of acrylic. Mixture shall be brushed uniformly on to surface and into voids. Where surface is to be exposed, surface finish of repair shall match adjacent surface.

C. Honeycombed and other defective concrete shall be removed down to sound concrete and patched to match adjacent surfaces.

3.8 FINISHING OF FORMED SURFACES

A. After removal of forms and repair of defects, surfaces of concrete shall be given finishes specified below.

B. When finish is to match a sample furnished to Contractor, sample finish shall be reproduced on an area at least 100 square feet in size in an inconspicuous location designated by Architect/Engineer prior to application in the specified area. Application of finish shall not be made until approved by Architect/Engineer.

C. Rough Form Finish: Surface left with texture imparted by forms; form facing material not specified; tie holes and defects shall be patched; fins exceeding 1/4-inch shall be chipped or rubbed off.

D. Smooth Form Finish: Surface produced by form facing material shall be a smooth, hard, uniform texture on concrete; forms may be plywood, tempered form grade hardboard, metal, plastic, paper or other acceptable material capable of producing finish; arrangement of facing material shall be orderly and symmetrical with number of seams kept to practical minimum; forms supported to prevent deflection and to maintain tolerances; tie holes and defects shall be patched; all fins shall be removed.

    1. Smooth Rubbed Finish: produced on newly hardened concrete no later than day following form removal and after defects repaired; surface wetted and rubbed with carborundum brick or other abrasive until uniform color and texture are produced; no cement grout used other than cement paste drawn from concrete itself by rubbing process.

E. Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of formed surface.

F. Final finish on formed surfaces shall continue uniformly across unformed surfaces.

G. Where a schedule of finishes is not included in this Section, or finishes are not shown on Drawings, the following finishes shall be used as applicable: Rough Form Finish for all concrete surfaces not exposed to public view; Smooth Form Finish with Smooth Rubbed Finish for all concrete surfaces exposed to public view.

3.9 TOLERANCES

A. All tolerances for concrete work shall be in accordance with ACI 117.

B. Contractor shall employ construction techniques to provide the following tolerances:

		Overall		Local Minimum	
		FF	FL	FF	FL
1.	Interior Slabs on Ground	25	20	17	15

C. Contractor shall set forms consistent with and is solely responsible for meeting requirements of F-numbers specified above.

D. Testing:

1. Floor tolerances will be tested by an independent testing agency paid for by Owner. Testing will be performed under provisions of Division 01.
2. Contractor shall conduct its own F-number tests within 72 hours of placing each slab section to determine adequacy of placing operations.
3. All tests performed shall conform to ASTM E1155. Equipment to be used for testing shall be dipstick.

E. All floors not conforming to these requirements shall be corrected by replacement or other methods approved by Architect/Engineer.

3.10 FIELD QUALITY CONTROL

A. Testing and analysis of concrete shall be performed under provisions of Division 01.

B. Testing firm will cast test cylinders and perform slump and air entrainment tests in accordance with ACI 301.

C. Three concrete test cylinders shall be cast from each increment of 100 cubic yards of each class of concrete placed each day or from each placement of each class if less than 100 cubic yards.

D. During hot or cold weather, as defined in Section 1.6, one additional test cylinder shall be cast from each increment of 100 cubic yards of each class of concrete placed each day or from each pour of each class if less than 100 cubic yards and be cured on site under same conditions as concrete it represents.

E. One slump test will be taken for each set of tests cylinders cast and whenever consistency of concrete appears to vary.

F. No water may be added to the concrete at the site unless pre-approved in writing by the Engineer for that specific mix. If pre-approved, the mix ticket must state how much water may be added.

END OF SECTION 033100

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SECTION 034113 - PRECAST CONCRETE HOLLOW CORE PLANKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Precast concrete hollow core floor planks.
2. Connection plates brackets and hangers.
3. Grouting plank joint keys.

B. Related Sections:

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Section 03 31 00 – Structural Concrete: Structural concrete.
3. Division 04 – Masonry: Masonry load bearing support walls.
4. Section 05 12 00 - Structural Steel Framing: Supporting steel lintels, headers.
5. Division 07 – Thermal and Moisture Protection: Firestopping materials.
6. Division 07 – Thermal and Moisture Protection: Caulking of butt joints of precast units at exposed underside of floor members.
7. Division 09 – Finishes: Anchorage devices for ceiling suspension.
8. Division 22 – Plumbing: Anchorage devices for plumbing equipment and piping hangers.
9. Division 23 – Heating, Venting and Air Conditioning: Anchorage devices for HVAC equipment and piping hangers.
10. Division 26 – Electrical: Anchorage devices for electrical equipment and piping hangers.

1.2 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.

B. American Society for Testing and Materials (ASTM International):

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A416 - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
4. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
5. ASTM A666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

C. American Welding Society (AWS):

1. AWS B2.1 - Specification for Welding Procedure and Performance Qualification.
2. AWS D1.1 - Structural Welding Code - Steel.
3. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. Precast/Prestressed Concrete Institute (PCI):

1. PCI JR-307 - Tolerances for Precast and Prestressed Concrete.
2. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.
3. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete.
4. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete.
5. PCI MNL-124 - Design for Fire Resistance of Precast Prestressed Concrete.
6. PCI MNL-126 - PCI Manual for the Design of Hollow-Core Slabs.

E. Underwriters Laboratories Inc. (UL):

1. UL - Fire Resistance Directory.

1.3 DESIGN REQUIREMENTS

A. Design components to withstand dead loads and live loads in unrestrained condition:

1. Floor Assembly: As indicated on Drawings.
2. Concentrated loads as indicated on Drawings.
3. Lateral Forces.

B. Maximum Allowable Deflection of Floor Planks: 1/360 span, cambered to achieve flat surface under dead load.

C. Design components to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.

D. Grouted Keys: Capable of transmitting horizontal shear force of 2,000 lb/ft.

E. Fire Resistance: Provide designs tested to provide ratings as follows:
1. Floor Assembly: Conform to UL Assembly No. J994, hour rating.

1.4 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate plank layout, unit identification marks, connection details, edge conditions, bearing requirements, support conditions, dimensions, openings, openings intended to be field cut, and relationship to adjacent materials.

C. Shop Drawings shall be submitted to State of Wisconsin for review and approval prior to any work related to precast concrete plank installation commencing on site.

D. Shop Drawings shall also be submitted and reviewed by the Engineer prior to any work related to precast concrete plank installation commencing on site.

E. Product Data: Indicate standard component configuration, design loads, individual plank weight, deflections, cambers, and fire ratings.

F. Fabricator:

1. Documented experience when required per paragraph 1.6.A.
2. Precast concrete manufacturing plant certification by the Precast/Prestressed Concrete Institute (PCI) Plant Certification Program in Category C2.

G. Erector: Documented experience when required per paragraph 1.6.B.

H. Design Data: Indicate calculations for loadings including uniform loads, point loads, and special loadings resulting from openings and stresses of planks and prestressing. Submit calculations for all embed materials/plates and hangers; signed and sealed by Professional Engineer licensed in the State of Wisconsin.

I. Fabricator's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

A. Design planks in accordance with requirements of:

1. PCI MNL-120 - Design Handbook.
2. PCI MNL-126 - Manual for the Design of Hollow Core Slabs.
3. PCI MNL-124 - Design for Fire Resistance of Precast Prestressed Concrete.
4. ACI 318.
5. ACI 301.

B. Design connections in accordance with PCI MNL-123 - Manual on Design of Connections for Precast Prestressed Concrete.

C. Produce planks in accordance with requirements of PCI MNL-116S. Maintain plant records and quality control program during production of precast planks. Make records available upon request.

1.6 QUALIFICATIONS

A. Fabricator: Company specializing in manufacturing Work of this section with five years documented experience.

1. Precast concrete fabricator shall be certified by the Precast/Prestressed Concrete Institute (PCI) Plant Certification Program.
2. Fabricator shall be certified at time of bidding in Category C2.

B. Erector: Company specializing in erecting Work of this section with five years documented experience.

C. Welder: Qualified within previous 12 months in accordance with AWS B2.1.

D. Design planks under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Wisconsin.

1.7 PRE-INSTALLATION MEETINGS

A. Division 01 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

C. Discuss anchor and weld plate locations, sleeve locations, and cautions regarding cutting or core drilling.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Division 01 - Product Requirements: Product storage and handling requirements.

B. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.

C. Mark each member with date of production and final position in structure.

1.9 COORDINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Coordinate with framing components directly associated with the Work of this Section.

C. Coordinate all openings with other contractors.

D. Coordinate location of hanger tabs and devices for mechanical and electrical work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Materials: ACI 301.

B. Tensioning Steel Tendons: ASTM A416 Grade 250, of diameter appropriate to member design.

C. Reinforcing Steel: ASTM A615, deformed steel bars.

D. Non-Shrink Grout: Non-metallic, minimum compressive strength of 10,000 psi at 28 days.

E. Cement Grout: Minimum compressive strength of 3,000 psi at 28 days.

2.2 ACCESSORIES

A. Connecting and Supporting Devices: Plates, angles, items cast into concrete, items connected to steel framing members, and inserts: ASTM A36 carbon steel.

B. Core Hole End Plugs: Cardboard insert with stiff concrete fill. Foamed-in-place insulation or Glass fiber insulation.

C. Hanger Tabs: Galvanized steel, designed to fit into grouted key joints, capable of supporting 500 lbs. dead load, predrilled to receive hanger.

D. Anchorage devices for ceiling suspension: Reference Division 09 - Finishes.

E. Anchorage devices for plumbing equipment and piping hangers: Reference Division 22 - Plumbing.

F. Anchorage devices for HVAC equipment and piping hangers: Reference Division 23 – Heating, Venting and Air Conditioning.

G. Anchorage devices for electrical equipment and piping hangers: Reference Division 26 - Electrical.

H. Bearing Pads: High density plastic, 1/8 inch thick, smooth on one side.

I. Sill Seal: Compressible glass fiber strips.

2.3 FABRICATION

A. Planks: Plant cast, prestressed, hollow core.

B. Dimensions as indicated on Drawings.

C. Weld reinforcing in accordance with AWS D1.4.

D. Embed anchors, inserts, plates, angles, and other items at locations indicated.

E. Fabricate openings required by other sections, at locations indicated.

F. Plank manufacturer shall provide for openings 10 inches round, square or larger as indicated on structural drawings.

G. All other openings shall be located and field drilled or cut by contractor requiring such work after hollow core slab units have been erected.

H. Openings and/or cutting of prestressing strand shall be approved by Architect/Engineer and manufacturer before drilling or cutting.

I. Cut exposed ends flush.

J. Plant Finish: Finish members to PCI MNL-116S Standard Grade.

K. Plant Finish: Exposed to view surfaces may contain small surface holes caused by small air bubbles, minor chipping or spalling at edges or ends, without major discoloration.

L. Connecting and Supporting Steel Devices: Do not paint surfaces in contact with concrete or surfaces requiring field welding.

2.4 FABRICATION TOLERANCES

A. Conform to PCI MNL-116S and PCI JR-307 - Tolerances for Precast and Prestressed Concrete.

B. Maximum Variation From Intended Camber: 1/4 inch in 10 feet.

C. Maximum Out of Square: 1/8 inch/10 feet, non-cumulative.

D. Maximum Misalignment of Anchors, Inserts, Openings: 1/8 inch.

E. Maximum Bowing of Members: Length of bow divided by 360.

2.5 SOURCE QUALITY CONTROL AND TESTS

A. Division 01 - Quality Requirements: Testing and inspection services.

B. Division 01 - Execution Requirements: Testing, adjusting, and balancing.

C. Reference Section 03 31 00 – Structural Concrete for testing of concrete and grout materials and mix designs.

D. Division 01 for requirements for testing and analysis of concrete and grout.

E. Inspect and test stressing tendons before delivery for compliance with specified standards.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify site conditions are ready to receive Work and field measurements are as indicated on shop drawings.

C. Verify supporting structure is ready to receive work.

3.2 PREPARATION

A. Prepare support devices for erection procedure and temporary bracing.

3.3 ERECTION

A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.

B. Align and maintain uniform horizontal and end joints, as erection progresses.

C. Maintain temporary bracing in place until final connections are made. Protect members from staining.

D. Install bearing pads and sill seal at bearing ends of planks as indicated on Drawings.

E. Adjust differential camber between precast members to tolerance before final attachment and grouting.

F. Adjust differential elevation between precast members to tolerance before final attachment.

G. Install hanger tabs in joints at a spacing required by Construction Product Manager and Mechanical Contractor and at locations as coordinated by Construction Manager.

H. Secure units in place. Perform welding in accordance with AWS D1.1.

I. Tape seal underside of plank joints to prevent grout leakage.

J. Grout longitudinal keys as indicated on Drawings.

K. Make plank-to-plank joints smooth using grout, troweled smooth. Transition differential elevation of adjoining planks with grout to maximum slope of 1: 12.

L. If a bonded structural topping is required, refer to Section 03 31 00 for surface preparation of precast plank.

3.4 ERECTION TOLERANCES

A. Division 01 - Quality Requirements: Tolerances.

B. Erect to the following tolerances:

1. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch in 10 feet and 3/8 inch in 100 feet, non-cumulative.
2. Maximum Offset from Indicated Alignment Between Members: 1/4 inch.
3. Maximum Variation From Dimensions Indicated on Reviewed Shop Drawings Drawings: Plus or minus 1/8 inch.

C. Exposed Joint Dimension: 3/8 inch plus or minus 1/4 inch.

3.5 CLEANING

A. Division 01 - Execution Requirements: Final cleaning.

B. Clean weld marks, dirt, and blemishes from surface of exposed members.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Division 01 - Execution Requirements: Protecting installed construction.

B. Protect members from damage caused by field welding or erection operations.

C. Use non-combustible shields during welding operations to protect adjacent Work.

END OF SECTION 034113

SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Architectural precast concrete cladding units.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide architectural precast units and connections capable of withstanding the following design loads with limits and under conditions indicated:

1. Loads: As indicated.

B. Delegated Design: Design precast architectural concrete cladding assembly and attachment methods, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements as indicated on the structural drawings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.

1. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

D. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches (300 by 300 by 50 mm). E. Welding certificates.

E. Delegated-Design Submittal: For precast architectural concrete cladding assembly and attachment methods indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: Manufacturer

G. Qualification Data: Installer

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: Signed by manufacturer.

B. Material Test Reports: For aggregates.

C. Field quality-control test and inspection reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Designated as a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units or designated as an APA-certified plant for production of architectural precast concrete products.

B. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

C. Installer Qualifications:

1. A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect Category A (Architectural Systems) for non-load-bearing members.

OR

2. Installer Qualifications: A precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project in same category as this Project and who can produce an Erectors' Post-Audit Declaration.

D. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of two sample panels approximately 16 sq. ft. (1.5 sq. m) in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

1.7 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.

B. Support units during shipment on nonstaining shock-absorbing material.

C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

D. Place stored units so identification marks are clearly visible, and units can be inspected.

E. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

F. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 MOLD MATERIALS

A. Molds: Rigid, dimensionally stable, non-absorptive material, warp and buckle free, that provides continuous and true precast concrete surfaces within fabrication tolerances indicated; nonreactive with concrete and suitable for producing required finishes.

1. Mold-Release Agent: Commercially produced form-release agent that does not bond with, stain or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

B. Form Liners: Units of face design, texture, arrangement, and configuration to provide specified finish in this Section. Use with manufacturer's recommended form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

C. Surface Retarder: Chemical set retarder, capable of temporarily delaying final hardening of newly placed concrete mixture to depth of reveal specified.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from galvanized-steel wire into flat sheets.

D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

E. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.3 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, seven-wire, low-relaxation strand.

1. Coat unbonded post-tensioning strand with post-tensioning coating complying with ACI 423.7 and sheath with polypropylene tendon sheathing complying with ACI 423.7. Include anchorage devices and coupler assemblies.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
2. Metakaolin: ASTM C 618, Class N.
3. Silica Fume: ASTM C 1240, with optional chemical and physical requirement.
4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33/C 33M, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

D. Coloring Admixture: ASTM C 979/C 979M, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

2.5 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or Type B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283/A 283M, Grade C.

D. Malleable Iron Castings: ASTM A 47/A 47M, Grade 32510 or Grade 35028.

E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500/A 500M, Grade B or Grade C.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65 (Grade 450).

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496/A 496M or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A or ASTM F 1554, Grade 36 (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.

K. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563 (ASTM A 563M); and hardened carbon-steel washers, ASTM F 436 (ASTM F 436M).

L. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M.

1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035B or SSPC-Paint 20.

M. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

2.6 ACCESSORIES

A. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.7 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150/C 150M, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.8 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

B. Limit use of fly ash and ground granulated blast-furnace slag to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.

C. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

D. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

E. Normal-Weight Concrete Mixtures: Proportion by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi (34.5 MPa) minimum.

F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.

G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.9 MOLD FABRICATION

A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.

B. Form Liner Pattern for Exposed Concrete Finish: Smooth faced (not rough-sawn), six-inch high horizontal board-formed cast-in-place concrete wall finish

C. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.

1. Form joints are not permitted on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly chamfered.

2.10 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

D. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

E. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

F. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

G. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

H. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.

I. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

J. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that does not show in finished structure.

K. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

L. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.11 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

2.12 FINISHES

A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units shall be as follows:

1. As-Cast Surface Finish: Provide surfaces to match approved sample for acceptable surface, air voids, sand streaks, and honeycomb.

B. Finish exposed surfaces of architectural precast concrete units to match form liner pattern.

C. Finish unexposed surfaces of architectural precast concrete units with as cast finish.

2.13 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

B. Do not install precast concrete units until supporting cast-in-place concrete has attained minimum allowable design compressive strength and supporting steel or other structure is structurally ready to receive loads from precast concrete units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.

1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
2. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
3. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch (19 mm).

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

D. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections and prepare reports:

1. Erection of loadbearing precast concrete members.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Visually inspect field welds and test according to ASTM E 165 or to ASTM E 709 and ASTM E 1444. High-strength bolted connections are subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

3.5 REPAIRS

A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780/A 780M.

D. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.6 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500

SECTION 040110 – MASONRY CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Cleaning unit masonry surfaces.

1.3 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi (690 kPa).

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to cleaning masonry including, but not limited to, the following:

a. Verify masonry-cleaning equipment and facilities needed to make progress and avoid delays.
b. Materials, material application, and sequencing.
c. Cleaning program.
d. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

A. Work Sequence: Perform masonry-cleaning work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints. Where repairs are required, delay further cleaning work until after repairs are completed, cured, and dried to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry surfaces.
5. Where water repellents are to be used on or near masonry, delay application of these chemicals until after cleaning.

1.6 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product.

1. Include material descriptions and application instructions.
2. Include test data substantiating that products comply with requirements.

C. Qualification Data: For paint-remover manufacturer and chemical-cleaner manufacturer.

1.7 INFORMATIONAL SUBMITTALS

A. Preconstruction Test Reports: For cleaning materials and methods.

B. Cleaning program.

1.8 QUALITY ASSURANCE

A. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

B. Chemical-Cleaner Manufacturer Qualifications: A firm regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

C. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used; protection of surrounding materials; and control of runoff during operations. Include provisions for supervising worker performance and preventing damage.

1. If materials and methods other than those indicated are proposed for any phase of cleaning work, add a written description of such materials and methods, including evidence of successful use on comparable projects and demonstrations to show their effectiveness for this Project.

D. Mockups: Prepare mockups of cleaning on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Cleaning: Clean an area approximately 25 sq. ft. (2.3 sq. m) for each type of masonry and surface condition.

    a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not test cleaners and methods known to have deleterious effect.
    b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.

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.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage one or more chemical-cleaner and paint-remover manufacturers to perform preconstruction testing on masonry surfaces.

1. Use test areas as indicated and representative of proposed materials and existing construction.

2. Propose changes to materials and methods to suit Project.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry-cleaning work to be performed according to product manufacturers' written instructions and specified requirements.

B. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least seven days after completion of cleaning.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

A. General: Basis-of-Design Manufacturers and Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to those listed in “PART 2 – PRODUCTS” of this specification section.

2.2 CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F (60 to 71 deg C).

C. Detergent Solution, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 1/2 cup (125 mL) of laundry detergent, and 20 quarts (20 L) of hot water for every 5 gal. (20 L) of solution required.

D. Mold, Mildew, and Algae Remover, Job Mixed: Solution prepared by mixing 2 cups (0.5 L) of tetrasodium pyrophosphate (TSPP), 5 quarts (5 L) of 5 percent sodium hypochlorite (bleach), and 15 quarts (15 L) of hot water for every 5 gal. (20 L) of solution required.

E. Acidic Cleaner: Manufacturer's standard acidic masonry cleaner composed of hydrofluoric acid or ammonium bifluoride blended with other acids, detergents, wetting agents, and inhibitors.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Basis of Design Product: Diedrich Technologies Inc., a division of Sandell Construction Solutions; Diedrich 101 Masonry Restorer, or Diedrich 101G Granite, Terra Cotta, & Brick Cleaner or Diedrich 200 Lime Solv.

2.3 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, glazed masonry, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABR Products, Inc.; ABR Rubber Mask.
b. Price Research, Ltd.; Price Mask.
c. PROSOCO, Inc.; Sure Klean Strippable Masking.

2.4 CHEMICAL CLEANING SOLUTIONS

A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended in writing by chemical-cleaner manufacturer.

B. Acidic Cleaner Solution for Nonglazed Masonry: Dilute acidic cleaner with water to produce hydrofluoric acid content of 3 percent or less, but not greater than that recommended in writing by chemical-cleaner manufacturer.

PART 3 - EXECUTION

3.1 PROTECTION

A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent paint removers and chemical cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist paint removers and chemical cleaners used unless products being used will not damage adjacent surfaces. Use protective materials that are waterproof and UV resistant. Apply masking agents according to manufacturer's written instructions. Do not apply liquid strippable masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Do not apply chemical solutions during winds of enough force to spread them to unprotected surfaces.
3. Neutralize alkaline and acid wastes before disposal.
4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.2 CLEANING MASONRY, GENERAL

A. Cleaning Appearance Standard: Cleaned surfaces are to have a uniform appearance as viewed from 10 feet (3 m) away by Architect.

B. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water do not wash over dry, cleaned surfaces.

C. Use only those cleaning methods indicated for each masonry material and location.

1. Brushes: Do not use wire brushes or brushes that are not resistant to chemical cleaner being used.
2. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that cleaning methods do not damage surfaces, including joints.

a. Equip units with pressure gages.

b. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with nozzle having a cone-shaped spray.
c. For water-spray application, use fan-shaped spray that disperses water at an angle of 25 to 50 degrees.
d. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F (60 and 71 deg C) at flow rates indicated.

D. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces. Keep wall wet below area being cleaned to prevent streaking from runoff.

E. Perform additional general cleaning, paint and stain removal, and spot cleaning of small areas that are noticeably different when viewed according to the "Cleaning Appearance Standard" Paragraph, so that cleaned surfaces blend smoothly into surrounding areas.

F. Water Application Methods:

1. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
2. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches (150 mm) from masonry surface and apply water in horizontal back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.

G. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces according to chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi (345 kPa). Do not allow chemicals to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.

H. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.

1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

I. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.3 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing remaining growth to dry as long as possible before removal. Remove loose soil and plant debris from open joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to planned cleaning methods. Extraneous substances include paint, calking, asphalt, and tar.

1. Carefully remove heavy accumulations of rigid materials from masonry surface with sharp chisel. Do not scratch or chip masonry surface.
2. Remove paint and calking with alkaline paint remover.

    a. Comply with requirements in "Paint Removal" Article.
    b. Repeat application up to two times if needed.

3.4 CLEANING MASONRY

A. Cold-Water Soak:

1. Apply cold water by intermittent spraying to keep surface moist.
2. Use perforated hoses or other means that apply a fine water mist to entire surface being cleaned.
3. Apply water in cycles of five minutes on and 20 minutes off.
4. Continue spraying until surface encrustation has softened enough to permit its removal by water wash, as indicated by cleaning tests for 72 hours.
5. Remove soil and softened surface encrustation from surface with cold water applied by low-pressure spray.

B. Cold-Water Wash: Use cold water applied by low-pressure spray.

C. Hot-Water Wash: Use hot water applied by low-pressure spray.

D. Mold, Mildew, and Algae Removal:

1. Wet surface with cold or hot water applied by low-pressure spray.
2. Apply mold, mildew, and algae remover by brush or low-pressure spray.
3. Scrub surface with medium-soft brushes until mold, mildew, and algae are thoroughly dislodged and can be removed by rinsing. Use small brushes for mortar joints and crevices. Dip brush in mold, mildew, and algae remover often to ensure that adequate fresh cleaner is used and that surface remains wet.
4. Rinse with cold or hot water applied by low-pressure spray to remove mold, mildew, and algae remover and soil.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup.

E. Acidic Chemical Cleaning:

1. Wet surface with cold water applied by low-pressure spray.
2. Apply cleaner to surface in two applications by brush or low-pressure spray.
3. Let cleaner remain on surface for period recommended in writing by chemical-cleaner manufacturer.
4. Rinse with cold water applied by low-pressure spray to remove chemicals and soil. Rinse until all foaming, if any, stops and suds disappear.
5. Repeat cleaning procedure above where required to produce cleaning effect established by mockup. Do not repeat more than once. If additional cleaning is required, use steam cleaning.

3.5 FIELD QUALITY CONTROL

A. A. Manufacturer's Field Service: Engage paint-remover manufacturers and chemical-cleaner manufacturer's factory-authorized service representatives for consultation and Project-site inspection and provide on-site assistance when requested by Architect. Have paint-remover manufacturer's and chemical-cleaner manufacturer's factory-authorized service representatives visit Project site not less than once to observing progress and quality of the work.

3.6 FINAL CLEANING

A. Clean adjacent nonmasonry surfaces of spillage and debris. Use detergent and soft brushes or cloths.

B. Remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

C. Remove masking materials, leaving no residues that could trap dirt.

END OF SECTION 040110

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SECTION 040120 – BRICK MASONRY REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Repointing joints with mortar.
2. Repointing joints with sealant.

1.3 DEFINITIONS

1. Low-Pressure Spray: 100 to 400 psi (690 to 2750 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Contractor will engage a qualified testing agency to perform preconstruction testing on masonry units as follows.

1. Provide test specimens as indicated and representative of proposed materials and construction.
2. Existing Mortar: Test according to ASTM C 295, modified as agreed by testing service and Contracting Officer's Representative for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength. Use X-ray diffraction, infrared spectroscopy, and differential thermal analysis as necessary to supplement microscopical methods. Carefully remove existing mortar from within joints at five locations designated by the testing service.
3. Temporary Patch: As directed by the Architect, provide temporary materials at locations from which existing samples were taken.

1.5 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

C. Shop Drawings: For the following:

1. Provisions for expansion joints or other sealant joints.
2. Provisions for flashing, lighting fixtures, conduits, and weep holes as required.

3. Replacement and repair anchors. Include details of anchors within individual masonry units, with locations of anchors and dimensions of holes and recesses in units required for anchors.

D. 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 (150 mm) long by 1/2 inch (13 mm) wide, set in aluminum or plastic channels.

    a. Have each set contain a close color range of at least six samples of different mixes of colored sands and cements that produce a mortar matching the cleaned masonry when cured and dry.
    b. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.

2. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.

    a. Have each set contain a close color range of at least three samples of different mixes of patching compound that matches the variations in existing masonry when cured and dry.

3. Sealant Materials: Joint sealants as recommended by testing agency.
4. Include similar Samples of accessories involving color selection.

E. Qualification Data: For brick masonry repointing specialist testing service.

F. Preconstruction Test Reports: For existing and replacement masonry units.

G. Quality-Control Program.

H. Restoration Program.

I. Cleaning Program

1.6 INFORMATIONAL SUBMITTALS

A. Preconstruction Test Reports: For existing masonry mortar.

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.

2. Restoration Worker Qualifications: Persons who are experienced and specialize in restoration work of types they will be performing. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.

B. Source Limitations: Obtain each type of material for masonry restoration (cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

C. 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.

D. Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials and Project site.

1. Include methods for keeping pointing mortar damp during curing period.
2. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

E. Cleaning Program: Where cleaning of existing brick and mortar is required in addition to the scope of Work defined in specification section 040110 – Masonry Cleaning, prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.

1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

F. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet (6 m) away by Contracting Officer's Representative. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

G. 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, each approximately 36 inches (900 mm) high by 48 inches (1200 mm) 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.

1.8 PREINSTALLATION CONFERENCE

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.

1.9 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 lime putty covered with water in sealed containers.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.10 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. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F (4 deg C), heat mortar ingredients and existing masonry walls to produce temperatures between 40 and 120 deg F (4 and 49 deg C).
2. When mean daily air temperature is below 40 deg F (4 deg C), provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for seven days after pointing.

C. 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 (32 deg C) and above unless otherwise indicated.

D. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

E. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.11 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.

B. Order all mortar materials for pointing mortar immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity to complete Project.

C. Perform masonry restoration work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry surfaces.
5. Where water repellents, specified in Division 07, are to be used on or near masonry work, delay application of these chemicals until after pointing.
6. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
7. Rake out mortar from joints to be repointed.
8. Point mortar joints and provide sealant at required soft joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
10. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
11. Remove paint.
12. Clean masonry surfaces.

D. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to comply with "Masonry Unit Patching" Article. Patch holes in mortar joints to comply with "Repointing Masonry" Article.

E.

PART 2 - PRODUCTS

2.1 MORTAR MATERIAL

A. Masonry Patching Compound: Factory-mixed or site-mixed cementitious product that is custom manufactured for patching masonry.

1. Products: Mortar materials and mixes shall comply with requirements established during testing of the existing mortar to match existing composition and color.
2. When possible incorporate the following in the mix design:

    a. Use formulation that is vapor- and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
    b. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
    c. Formulate patching compound used for patching brick in colors and textures to match each masonry unit being patched. Provide not less than three colors to enable matching the color, texture, and variation of each unit.

2.2 PAINT REMOVERS

A. Low-Odor, Solvent-Type Paint Remover: Manufacturer's standard low-odor, water-rinsable solvent-type gel formulation, containing no methanol or methylene chloride, for removing paint coatings from masonry.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ABR Products, Inc.; Super Bio Strip Gel.
    b. Cathedral Stone Products, Inc.; S-301 S-303 or S-305.
    c. Dumond Chemicals, Inc.; Peel Away 6 Peel Away 7 or Peel Away 21.
    d. PROSOCO; Enviro Klean Safety Peel 1 or Enviro Klean Safety Peel 3.

2.3 CLEANING MATERIALS

A. Where cleaning of brick and mortar joints is required in addition to scope of Work in specification section 040110 – Masonry Cleaning use same methods and materials in referenced specification section.

2.4 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ABR Products, Inc.; Rubber Mask.
    b. Price Research, Ltd.; Price Mask.
    c. PROSOCO; Sure Klean Strippable Masking.

B. Sealant Materials:

1. Provide manufacturer's standard chemically curing, elastomeric sealant(s) of base polymer and characteristics indicated below that comply with Testing Agency’s applicable requirements

a. Single-component, nonsag urethane sealant.
b. Colors: Provide colors of exposed sealants to match colors of masonry adjoining installed sealant unless otherwise indicated.
c. Ground-Mortar Aggregate: Custom crushed and ground pointing mortar sand or existing mortar retrieved from joints. Grind to a particle size that matches the adjacent mortar aggregate and color. Remove all fines passing the 100 sieve.

C. Joint-Sealant Backing:

1. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) or Type B (bicellular 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 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 acceptable.

D. Setting Buttons: Resilient plastic buttons, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.

E. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.

F. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #79, Alkyd Anticorrosive Metal Primer or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

1. Use coating requiring no better than SSPC-SP 2, "Hand Tool Cleaning" SSPC-SP 3, "Power Tool Cleaning" or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning" surface preparation according to manufacturer's literature or certified statement.
2. Use coating with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Miscellaneous 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.

a. Little possibility of damaging exposed surfaces.
b. Consistency of each application.
c. Uniformity of the resulting overall appearance.
d. Do not use products or tools that could do the following:

1) Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
2) Leave a residue on surfaces.

2.5 MORTAR MIXES

A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.

B. 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 will retain 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.

C. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Contracting Officer's Representative's approval.

1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.

D. Do not use admixtures in mortar unless otherwise indicated.

E. Mortar Proportions: Mix mortar materials to match existing building mortar in the same proportions:

1. Pointing Mortar for Brick (baseline for bidding only): 1 part Portland cement, 6 parts lime, and 12 parts sand. Project pointing mortar to match tested mortar from existing building.

a. Add mortar pigments to produce mortar colors as required to match existing mortar.
b. Utilize metal oxides, clays crushed oyster shells or lime particles as required to match existing pre-tested mortar compositions

2. Rebuilding (Setting) Mortar: Same as pointing mortar except mortar pigments are not 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.

3.2 MASONRY REPOINTING, GENERAL

A. Appearance Standard: Repointed surfaces are to have a uniform appearance as viewed from 20 feet (6 m) away by Architect.

3.3 PAINTING STEEL UNCOVERED DURING THE WORK

A. Inspect steel exposed during masonry removal. Where Contracting Officer's Representative determines that it is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:

1. Remove paint, rust, and other contaminants according to SSPC-SP 2, "Hand Tool Cleaning;" SPC-SP 3, "Power Tool Cleaning;" or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning", as applicable to meet paint manufacturer's recommended preparation.
2. Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

B. If on inspection and rust removal, the cross section of a steel member is found to be reduced from rust by more than 1/16 inch (1.6 mm), notify Contracting Officer's Representative before proceeding.

C. Patching Bricks:

1. Remove loose material from masonry surface. Carefully remove additional material so patch will not have feathered edges but will have square or slightly undercut edges on area to be patched and will be at least 1/4 inch (6 mm) thick, but not less than recommended by patching compound manufacturer.
2. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of masonry unit.
3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
4. Rinse surface to be patched and leave damp, but without standing water.
5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
6. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4 inch (6 mm) or more than 2 inches (50 mm) thick. Roughen surface of each layer to provide a key for next layer.
7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the masonry unit. Shape and finish surface before or after curing, as determined by testing, to best match existing masonry unit.
8. Keep each layer damp for 72 hours or until patching compound has set.

3.4 WIDENING JOINTS

A. Do not widen a joint, except where indicated or approved by Contracting Officer Representative.

B. Location Guideline: Where an existing masonry unit abuts another or the joint is less than 1/8 inch (3 mm), widen the joint for length indicated and to depth required for repointing after obtaining Contracting Officer's Representative's approval.

C. Carefully perform widening by cutting, grinding, routing, or filing procedures demonstrated in an approved mockup.

D. Widen joint to width equal to or less than predominant width of other joints on building.

E. Make sides of widened joint uniform and parallel. Ensure that edges of units along widened joint are in alignment with joint edges at unaltered joints.

3.5 REPOINTING MASONRY

A. Rake out and repoint joints to the following extent:

1. All joints in areas indicated.
2. Joints where mortar is missing or where they contain holes.
3. Cracked joints where cracks can be penetrated at least 1/4 inch (6 mm) by a knife blade 0.027 inch (0.7 mm) thick.
4. Cracked joints where cracks are 1/16 inch (1.6 mm) or more in width and of any depth.
5. Joints where they sound hollow when tapped by metal object.
6. Joints where they are worn back 1/4 inch (6 mm) or more from surface.
7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
8. Joints where they have been filled with substances other than mortar.
9. Joints indicated as sealant-filled joints.

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 1/2 times the joint width, but not less than ½ inch (13 mm) or not less than that required to expose sound, unweathered mortar. All loose and disintegrated mortar beyond the minimum depth should be carefully removed.
2. Remove mortar from 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 masonry units or widen joints. Replace or patch damaged masonry units as directed by Contracting Officer's Representative.

    a. Cut out mortar by hand with chisel and resilient mallet. Do not use power operated grinders without Contracting Officer's Representative's written approval based on approved quality-control program.
    b. Cut out center of mortar bed joints using angle grinders with diamond impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.
    c. Remove all loose particles from the joint using a stiff fiber brush, low to medium pressurized water (temperature permitting) or via compressed air.

D. Notify the 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. Mortar should be thoroughly mixed to obtain uniformity of both visual and physical characteristics. Dry ingredients should be mixed before adding water. The mixture should be prehydrated to help prevent shrinkage on drying.
3. 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 (9 mm) until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
4. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than 3/8 inch (9 mm). Fully compact each layer via tooling 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.
5. 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.
6. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.

    a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
    b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.

7. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.
8. Mortar shall be finished to match existing building mortar. Use techniques such as wire brushing after tooling, low pressure spray to leave sand exposed, or other techniques as determined via mock up matching. Joints to be tooled concave, raked or other method to match existing building joints.

F. Pointing with Sealant:

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 Testing Agency recommended joint sealant and the following:

    a. Install cylindrical sealant backing beneath the sealant, except where space is insufficient. There, install bond-breaker tape.
    b. Install sealant using only proven installation techniques that will ensure that sealant will be 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 masonry and matching the contour of adjoining mortar joints.

c. Install sealant as recommended 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 (13 mm) deep or less than 1/4 inch (6 mm) deep.

d. Immediately after first tooling, apply ground-mortar aggregate to sealant, gently pushing aggregate into the surface of sealant. Retool sealant to form smooth, uniform beads, slightly concave. Remove excess sealant and aggregate 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.

4. Cure sealant according to Testing Agency's recommendations.

G. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.6 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, spray applied at low pressure.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Wash adjacent woodwork and other 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. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

3.7 FIELD QUALITY CONTROL

A. Inspectors: Contractor will engage qualified independent inspectors to perform inspections and prepare test reports. Allow inspectors use of lift devices and scaffolding, as needed, to perform inspections.

B. Notify inspectors and the Architect in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until inspectors and Contracting Officer's Representative have had reasonable opportunity to make inspections and observations of work areas at lift device or scaffold location.

END OF SECTION 040120

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SECTION 042000 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Standard Specifications, Proposal Documents, Special Provisions, Supplemental Specifications, Bid Item Manual and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Embedded Flashing.
7. Miscellaneous masonry accessories.
8. Veneer (common) brick.
9. Cavity Wall Insulation.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength.
3. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.

4. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.6 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
2. For exposed brick, include test report for efflorescence according to ASTM C 67.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Verification: For each type and color of the following:

1. CMUs.
2. Face brick, in the form of straps of five or more bricks for approval.
3. Accessories embedded in masonry.

D. Qualification Data: For testing agency.

E. Material Certificates: For each type and size of the following:

1. Masonry units.

    a. Include material test reports substantiating compliance with requirements.
    b. For masonry units, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

F. 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 according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

G. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

H. 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. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 01 Section "Quality Requirements" for mockups.

1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high.
2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
3. Protect approved sample panels from the elements with weather-resistant membrane.
4. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.

    a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

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. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT 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.

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 ACI 530.1/ASCE 6/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 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Regional Materials: Provide CMUs that have been manufactured within 500 miles (800 km) of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. 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 bullnose units for all outside corners and pass door jambs unless otherwise indicated.

C. Integral Water Repellent: Provide units made with integral water repellent for exterior exposed units and where indicated.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. ACM Chemistries, Inc.; RainBloc.
    b. BASF Aktiengesellschaft; Rheopel Plus.
    c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block

D. CMUs: Normal Weight, ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi (19.3 MPa).
2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
3. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.3 MASONRY LINTELS

A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs 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.

2.4 BRICK

A. MANUFACTURERS

1. Basis-of-Design Manufacturer and Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Manufacturer: Colonial Brick Corp., Cayuga, IN
   b. Product: Old Town

B. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.

C. Face Brick: Facing brick complying with ASTM C 216.

D. Mortar: Mortar color shall match the existing conditions.

E. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3500 psi (23.10 MPa).

F. Initial Rate of Absorption: Less than 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67.

G. Size (Actual Dimensions): Brick size shall match existing.

2.5 MORTAR AND GROUT MATERIALS

A. Regional Materials: Provide aggregate for mortar and grout, cement, and lime that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. Portland Cement: ASTM C 150, 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.

C. Hydrated Lime: ASTM C 207, Type S.

D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

E. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

F. Aggregate for Grout: ASTM C 404.

G. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. ACM Chemistries, Inc.; RainBloc for Mortar.
b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

H. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Mill- galvanized, carbon steel.
2. Exterior Walls: 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. Wire Size for Veneer Ties: 0.187-inch (4.76-mm) diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.7 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.

2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.

C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- (2.66-mm-) thick, steel sheet, galvanized after fabrication.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.35-mm-) diameter, hot-dip galvanized steel wire.

D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

E. Brick Veneer Anchors and Ties:

1. General: Anchors and ties shall be of zinc-coated steel or copper-coated steel. Except for steel wire, zinc coating shall conform to ASTM A 153. Steel wire shall be zinc-coated in accordance with ASTM A 116 for Class 2 coating.

2.8 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

B. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Load Capacity: 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 according to ASTM E 488, conducted by a qualified independent testing agency.
2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 unless otherwise indicated.
3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.9 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with Division 07 Section "Sheet Metal Flashing and Trim"" and as follows:

1. Metal Drip Edge: Fabricate 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.
2. Metal Sealant Stop: Fabricate 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.

B. Flexible Flashing: Use the following unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1.02 mm).

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
2) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
3) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
4) Hohmann & Barnard, Inc.; Textroflash.
5) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
6) Substitutions: Allowed in accordance with the requirements of General Conditions and Division 1 section on Substitutions.

b. Accessories: Provide termination bar, preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.

C. Application: Unless otherwise indicated, use the following:

1. Where flashing is indicated to receive counterflashing, use metal flashing.
2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
3. Where flashing is partly exposed and is indicated to terminate at the wall face, use or flexible flashing with a metal drip edge.
4. Where flashing is fully concealed, use flexible flashing.

D. Solder and Sealants for Sheet Metal Flashings: As specified in Division 07 Section "Sheet Metal Flashing and Trim."

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.

2.10 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, 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 D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, 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, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following unless otherwise indicated:

1. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1) Mortar Net USA, Ltd.; Mortar Net Weep Vents.
2) Substitutions: Allowed in accordance with the requirements of General Conditions and Division 1 section on Substitutions.

E. 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, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Advanced Building Products Inc.; Mortar Break.
b. Archovations, Inc.; CavClear Masonry Mat.
c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
d. Mortar Net USA, Ltd.; Mortar Net.
e. Substitutions: Allowed in accordance with the requirements of General Conditions and Division 1 section on Substitutions.

2. Provide the following 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.

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.11 CAVITY-WALL INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, closed-cell product extruded with an integral skin and with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84. Thickness as shown on drawings and maximum water absorption of .1% by volume, "K" factor .18 at 40°F (5.4 R), "K" factor .20 at 75°F (5.0 R).

B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.12 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Diedrich Technologies, Inc.
   b. EaCo Chem, Inc.
   c. ProSoCo, Inc.

2.13 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S.
3. For mortar parge coats, use Type S.

4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type S.

C. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, paragraph 4.2.2 for specified 28-day compressive strength of 2500 psi (17.5 MPa).
3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

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 work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

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. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

C. 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.

D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/194 sq. cm (30 g/30 sq. in.) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch (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).

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches (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 racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

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.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together using one of the following methods:

1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches (406 mm) o.c. horizontally and 16 inches (406 mm) o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches (305 mm) of openings and space not more than 24 inches (915 mm) apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches (610 mm) o.c. vertically.

    a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
    b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.

2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

    a. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
    b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
    c. Provide continuous horizontal wire in the facing wythe.

3. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Apply air barrier to face of backup wythe to comply with Division 07 Section "Fluid-Applied Membrane Air Barriers."

D. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches (300 mm) o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

E. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

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 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuous horizontal wire in the facing wythe.

D. Provide continuity at wall intersections by using prefabricated T-shaped units.

E. Provide continuity at corners by using prefabricated L-shaped units.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.9 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to masonry backup with masonry ties to comply with the following requirements:

1. Locate ties to allow maximum vertical differential movement of ties up and down.

B. Space ties as indicated, but not more than 16 inches (406 mm) o.c. vertically and 24 inches (610 mm) o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. (0.25 sq. m) of wall area. Install additional anchors within 12 inches (305 mm) of openings and at intervals, not exceeding 24 inches (914 mm), around perimeter.

3.10 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.

C. If not shown on plans, provide at maximum 30 feet joint-to-joint and at maximum 20 joint-to-corner in locations to coincide with changes in wall height or thickness, construction joints in foundation, chases or recesses, columns, sides of wall opening, return angles or reentrant corners, as approved by Architect/Engineer.

3.11 LINTELS

A. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

1. Provide (2) #5 in continuous bond beams immediately above the lintel and below the sill. Extend reinforcing a minimum of 2'-0" beyond jambs of openings.

B. Provide minimum bearing of 8 inches (200 mm) at each jamb unless otherwise indicated.

3.12 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND 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 vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated. Install pre-formed corners and end dams fabricated from the same material used for flashings.

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 multi-wythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 12 inches to a point above the top of the cavity drainage material. Mechanically fasten the top of the self-adhering flashing to the face of the inner wythe utilizing a continuously-applied termination bar.
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. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall and adhere flexible flashing to top of metal drip edge.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Use wicking material to form weep holes above flashing under brick sills.
3. Space weep holes formed from wicking material 16 inches (400 mm) o.c.
4. Trim wicking material flush with outside face of wall after mortar has set.

E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.

F. Install vents in head joints of exterior wythes at spacing indicated. Use specified weep/vent products to form vents.

3.13 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Vertical Reinforcement

1. Unless otherwise noted, minimum grouted vertical reinforcement for masonry walls of thickness 8 inches or greater shall correspond to:

   a. (1) #5 wall bars (one bar each face of core) at 32 inch center to center spacing. Wall bars shall be continuous full height of wall and embedded into horizontal bond beams above.
   b. (1) #5 by 4'-0" long dowel bar (centered in core) at 48 inch center to center spacing. Dowel bars shall be embedded 2'-0" into foundation walls or grade beams at locations matching the wall bars described above. Alternate #5 hooked footing dowel bars shall be provided where walls bear directly on footings.

2. Unless otherwise noted, minimum grouted vertical reinforcement for masonry walls of thickness less than 8 inches shall correspond to:

   a. (1) #5 wall bars (centered in core) at 32 inch center to center spacing. Wall bars shall be continuous full height of wall and embedded into horizontal bond beams above.
   b. (1) #5 by 4'-0" long dowel bar (centered in core) at 48 inch center to center spacing. Dowel bars shall be embedded 2'-0" into foundation walls or grade beams at locations matching the wall bars described above. Alternate #5 hooked footing dowel bars shall be provided where walls bear directly on footings.

3. Reinforce jambs of masonry openings greater than 1'-0" with (2) #5 bars grouted solid. Extend reinforcing a minimum 2'-0" beyond openings.

D. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.

1. Level 1 Special Inspections shall be performed per Table 1704.5.1 of the International Building Code.

B. Testing Prior to Construction: One set of tests.

C. Testing Frequency: One set of tests for each 1000 sq. ft. of wall area or portion thereof.

D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.15 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.16 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fabrication, transportation, delivery, and erection of structural steel.
2. Structural steel, framing members, support members, welds, and fasteners.
3. Base plates, anchor rods, bearing plates, weld plates, setting plates, anchors.
4. Inserts for steel work.
5. Non-shrink grout under base plates.

B. Products Supplied But Not Installed Under This Section:

1. Section 03 31 00 – Structural Concrete: Non-shrink grout under base plates and anchors for casting into concrete.
2. Division 04 – Masonry: Anchors for embedding into masonry.

C. Related Sections:

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Section 03 41 13 – Precast Concrete Hollow Core Plank: Precast concrete anchorage devices for attachment to structural steel.
3. Section 05 21 00 - Steel Joist Framing.
4. Section 05 31 23 - Steel Roof Decking: Support framing for small openings in roof deck.
5. Division 07 - Thermal and Moisture Protection: Firestopping materials.
6. Division 09 – Finishes: Finish painting.

1.2 REFERENCES

A. ASTM International (American Society for Testing and Materials)

1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
4. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
5. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
7. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

8. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
9. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
10. ASTM A563 – Standard Specification for Carbons and Alloy Steel Nuts.
11. ASTM A673 – Standard Specification for Sampling Procedure for Impact Testing of Structural Steel.
12. ASTM A992 - Standard Specification for Structural Steel Shapes.
13. ASTM F436 – Standard Specification for Hardened Steel Washers.
14. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

B. American Welding Society (AWS).

1. AWS A2.0 - Standard Welding Symbols.
2. AWS D1.1 - Structural Welding Code.

C. American Institute of Steel Construction, Inc (AISC).

1. AISC – Steel Construction Manual, Current Edition.
2. AISC - Code of Standard Practice for Steel Buildings and Bridges.
3. AISC - Specification for Architectural Exposed Structural Steel.

D. Research Council on Structural Connections (RCSC)

1. RCSC - Specification for Structural Joints Using ASTM A325 or A490 Bolts.

E. The Society for Protective Coatings (SSPC)

1. Volume 1 – Good Painting Practices, Current Edition.
2. Volume 2 – Systems and Specifications.

1.3 SUBMITTALS

A. Division 01: Submittal Procedures.

B. Shop and Erection Drawings:

1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.

C. Show all connections. Connections shall be designed and drawings and calculations shall be Stamped/Sealed by the Professional Engineer, registered in State of Wisconsin, who is responsible for connection design.

1. Show cambers and loads.
2. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths.
3. Indicate cleaning and painting specifications.

4. Assume responsibility for dimensional errors.
5. Field verify dimensions affected by existing construction prior to submitting Shop Drawings and so note verified dimensions on shop drawings.
6. Field verify existing anchor bolt placements and modify base plates to accommodate field conditions.
7. Fabricator shall check shop drawings before Submittal.

D. Shop drawings which include the following and have been prepared under supervision of a Professional Engineer registered in the State of Wisconsin and shall bear seal and signature of supervising design engineer:

1. Calculations, connection drawings, job standards, and any other items that are performance specified or designed by Contractor's engineer.
2. Provide holes for installation of other work.
3. Any omission from shop drawings of any materials required by Contract Documents shall not relieve Contractor of responsibility of furnishing and installing such materials, even though shop drawings may have been reviewed and approved.

E. Manufacturer's Mill Certificate: Submit under provisions of Division 01 certifying that products meet or exceed specified requirements.

F. Mill Test Reports: Submit under provisions of Division 01 Manufacturer's Certificates, indicating structural strength, destructive and non-destructive test analysis.

G. Welders Certificates: Submit under provisions of Division 01 Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.4 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC -Specifications and the AISC Code of Standard Practice for Steel Buildings and Bridges.

B. Special inspections shall be performed in accordance with the International Building Code (IBC) 2006 Edition as follows:

1. Chapter 17: Structural Tests and Special Inspections:

a. Section 1704.3: Steel Construction Table.
b. Table 1704.3: Required Verification and Inspection of Steel Construction.

1.5 QUALIFICATIONS

A. Fabricator: Company specializing in performing the work of this Section with minimum ten years documented experience and AISC Certified.

B. Erector: Company specializing in performing the work of this Section with minimum ten years documented experience.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings and shop drawings.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Structural Steel W-Shape and WT-Shape Members: ASTM A992, Fy = 50 ksi.

B. Structural Steel Angles, Plates, Channels and Other Rolled Members: ASTM A36, Fy = 36 ksi.

C. Rectangular or Square (HSS) Hollow Structural Sections: ASTM A500, Grade B, Fy = 46 ksi.

D. Round (HSS) Hollow Structural Sections: ASTM A500, Grade B, Fy = 42 ksi.

E. Steel Pipe: ASTM A53, Grade B, Fy = 35 ksi.

F. Shear Stud Connectors: ASTM A108 Grade 1015, Fu = 60 ksi Forged Steel, headed and uncoated.

G. Bolts, Nuts, and Washers: ASTM A325 High-Strength Bolts, Type 1 – Medium Carbon, Carbon Boron or Medium Carbon Alloy Steel finish; with ASTM A563 heavy hex nuts and ASTM F436 washers, head markings on bolts, fully traceable;

1. Manufacturers:

a. Nucor Fastener.
b. St. Louis Screw & Bolt Co.
c. Hayden Bolts.
d. Approved equal.

H. Threaded Anchor Bolts (Anchor Rods): ASTM F1554, Class 2A threads; Grade 36; straight; headless with ASTM A563 heavy hex nuts, and ASTM F436, Type 1 washers.

I. Non-threaded Anchor Bolts (Anchor Rods): ASTM F1554; Grade 36; straight; headless.

J. Welding Electrodes: E70XX and shall comply with AWS D1.1; type required for materials being welded.

K. Non-Shrink Grout: Pre-mixed compound with non-metallic aggregate, cement, water reducing and plasticizing agents; capable of minimum compressive strength of 7,000 psi.

L. Shop Primer: Exposed Interior and Exterior Steel Receiving Additional Coatings: Primer shall be Universal Metal Primer for Structural Steel compatible with subsequent finish coats specified in Division 09 - Finishes.

2.2 FABRICATION

A. Fabricate items of structural steel in accordance with AISC specifications, and as shown on approved shop drawings.

B. Field connections are to be bolted unless welded, or other types of connections are indicated.

C. Bolted connections shall be made with ASTM A325 high strength bolts, unless otherwise noted.

D. Connections shall support a minimum of one-half the total uniform load capacity shown in the AISC ASD tables for allowable loads on beams for the given shape, span, and steel specified, unless otherwise noted.

E. Connections shall be made with standard double angles unless otherwise shown.

F. Install high strength threaded fasteners in accordance with RCSC - “Specifications for Structural Joints Using ASTM A325 or A490 bolts”.

G. Welding shall comply with AISC and AWS Codes for procedures, appearance, quality of welds, and for methods used in correcting welding work.

H. All welds shall be made by AWS pre-qualified welders, certified for welds made.

I. Minimum size of fillet welds shall be as specified in TABLE J2.4 of AISC Manual of Steel Construction.

J. Minimum Strength of Welded Connections: Unless noted otherwise on drawings, all shop and field welds shall develop full tensile strength of member of element joined.

K. All members with moment connections, noted on drawings, shall be welded to develop full flexural capacity of member, unless noted otherwise on drawings.

L. Provide holes required for securing other work to structural steel framing and for passage of other work through steel members, as shown on approved shop drawings.

M. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

N. Verify or supplement dimensions shown on Drawings by field measurements to assure fit of new work.

O. Jointed members shall be sealed with continuous welds unless otherwise noted.

P. Struts and Braces:

1. Connections for all struts hangers, and braces shall have connection designed to develop full allowable tensile strength of member unless design force is indicated on drawings.

2.3 FINISH

A. Prepare interior structural component surfaces for general work in accordance with SSPC - SP1 and SP3 as a minimum.

B. Prepare structural component surfaces of exterior steel in accordance with SSPC - SP1 and SP6 as a minimum.

C. Coated surfaces, interior or exterior, shall be prepared in accordance with coating manufacturer's SSPC requirements if more stringent then listed above.

D. Shop Primed Structural Steel Members: Minimum one coat for interior steel, minimum two coats for exterior steel. Prime coats shall be a minimum of 2.4 mils dry thickness unless manufacturer has more stringent requirements.

E. Do not prime surfaces that will be fireproofed, in contact with concrete. Do not prime surfaces that will be field welded unless coated with a weldable primer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that field conditions are acceptable and are ready to receive work in accordance with Drawings and shop drawings.

B. Verify anchors and anchor rods have been preset into connection work in accordance with Drawings and shop drawings.

C. Beginning of installation and erection means that existing conditions have been checked and found acceptable.

D. Cost of corrections shall be borne by this Section if variances are not identified prior to start of installation.

3.2 ERECTION

A. Erect structural steel in accordance with AISC Specifications.

B. Store steel on site on substantial shores or blocking to keep free of ground and to prevent bending, buckling, or twisting.

C. Prevent water collection on members.

D. Provide for erection loads, wind, and dead loads, and provide sufficient temporary bracing to maintain structure in safe, plumb, and true alignment until completion of erection and installation of permanent bracing.

E. Do no final bolting or welding until structure has been properly aligned and plumbed.

F. Do not field cut or alter structural members without prior approval of Professional Engineer of Record.

G. Field weld components indicated on Drawings and shop drawings.

H. All bolted joints may be installed as Snug Tightened joints as specified and permitted in the RCSC - Specification, unless otherwise noted.

I. Clean and prime welds, bolt and rivet heads, abrasions of prime coat, and surfaces not previously shop primed except surfaces to be in contact with concrete after erection.

J. Grout solid under base plates and bearing plates in accordance with AISC - Code of Standard Practice for Steel Buildings and Bridges.

K. Contact surfaces of field connections shall be free from dust, oil, loose scale, burrs, pits, and other defects that prevent solid seating of parts.

L. Clean all surfaces of dirt, mud, oil, or grease that would impair bonding of fireproofing or concrete.

M. Reaming is not allowed if reaming weakens or makes it impossible to fill holes or adjust accurately after being reamed.

3.3 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01 – General Requirements.

END OF SECTION 051200

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SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Open web steel joists with bridging, attached seats, chord extensions, and anchors.

B. Related Sections:

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Section 04 20 11: Concrete Unit Masonry.
3. Section 05 12 00 - Structural Steel Framing.
4. Section 05 31 23 - Steel Roof Decking.
5. Section 06 10 00 - Rough Carpentry: Joist chord wood nailers and blocking.
6. Division 07 - Applied Fireproofing: Fireproofing.
7. Division 09 – Finishes.

1.2 REFERENCES

A. American Institute of Steel Construction (AISC)

1. AISC – Steel Construction Manual, Current Edition.

B. ASTM International (American Society for Testing and Materials)

1. ASTM A36 - Structural Steel.
2. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.
3. ASTM A307 - Carbon Steel Threaded Standard Fasteners.
4. ASTM A325 - High Strength Bolts for Structural Steel Joints.
5. ASTM A992 - Steel for Structural Shapes For Use in Building Framing.

C. American Welding Society (AWS).

1. AWS A2.0 - Standard Welding Symbols.
2. AWS D1.1 - Structural Welding Code.

D. Federal Specification (FS)

1. FS TT-P-636 - Primer Coating, Alkyd, Wood and Ferrous Metal.

E. Steel Joist Institute (SJI)

1. SJI - Standard Specifications for Open Web Steel Joists K and KCS Series.
2. SJI - Standard Specifications for Longspan Steel Joists LH and Deep Longspan Steel Joists DLH Series and Super Long Span Steel Joists SLH Series.

3. SJI - Technical Digest #9 - Handling and Erection of Steel Joists and Joist Girders.

F. The Society for Protective Coatings (SSPC)

1. Volume 1 – Good Painting Practices, Current Edition.
2. Volume 2 – Systems and Specifications.

1.3 SUBMITTALS

A. Division 01 – Submittal Procedures: Requirements for submittals.

B. Shop drawings which include the following and have been prepared under supervision of a Professional Engineer registered in the State of Wisconsin and shall bear seal and signature of supervising design engineer:

1. Indicate standard designations, configuration, sizes, spacing, and locations of joists, joist leg extensions.
2. Joist coding, bridging, connections, attachments.
3. Cambers and loads.

C. Joist design submittal shall be sealed by Structural Engineer experienced in design of this work and registered in State of Wisconsin, and submitted for approval prior to the start of construction.

D. Designs shall include loads indicated in details and loading diagrams indicated on Drawings.

E. Designs shall include net uplift loads indicated on Drawings.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with SJI Standard Specifications, Load Tables, and Weight Tables, including headers and other supplementary framing.

B. Fabricator: Company specializing in performing work of this Section with minimum 5 years experience.

C. Erector: Company specializing in performing work of this Section with minimum 5 years experience.

D. Design connections not detailed on Drawings under direct supervision of a Professional Engineer experienced in design of this work and licensed in State of Wisconsin.

E. Welders: Welders shall be currently certified for welds to be performed. Certificates shall be available on request.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site under provisions of Division 01 – Product Requirements and to SJI requirements.

B. Store steel joists on substantial shores or blocking to keep free of ground and to prevent bending, buckling, or twisting.

C. Prevent water collection in members.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on Drawings and shop drawings.

PART 2 - PRODUCTS

2.1 FABRICATORS

A. Vulcraft, Division of Nucor Corp.

B. Canam Steel Corp.

C. New Columbia Joist Co.

D. Substitutions: In accordance with Division 01 - Product Requirements.

2.2 MATERIALS

A. Open Web Joist Members: SJI Type K and KCS open web.

B. Open Web Joist Members: SJI Type LH long span.

C. Anchor Bolts, Nuts, and Washers: ASTM A325 or Galvanized to ASTM A153.

D. Angles, Plates, and Channels: ASTM A36.

E. Primer: FS TT-P-636 or SSPC 15-68T, Red or Gray Oxide, whichever is standard with manufacturer unless not compatible with finish coat.

F. Structural Steel for Supplementary Framing and Joist Extensions: ASTM A992.

G. Welding Materials: AWS D1.1; type required for materials being welded.

2.3 FABRICATION

A. Fabricate steel joists in accordance with approved shop drawings and SJI Standard Specification.

B. Provide sloped bearing ends where joist slope exceeds 1/4 inch in 12 inches.

C. Provide bearing lengths per SJI requirements unless greater bearing lengths are shown on Drawings.

D. Provide bottom and top chord extensions as indicated on Drawings and as required.

E. Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord.

F. Provide either an extended bottom chord element or a separate unit to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surfaces, unless otherwise indicated.

G. Camber joists in accordance with Steel Joist Institute (SJI) specifications.

H. Drill holes in chords necessary for attachment of wood nailers.

I. All joists shall be fabricated with top and bottom chords made with angles.

2.4 FINISH

A. Prepare joist component surfaces in accordance with SSPC Standards.

B. Shop prime joists. Do not prime surfaces that will be fireproofed, or field welded.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means erector accepts existing conditions.

3.2 ERECTION

A. Erect steel joists in accordance with approved shop drawings and SJI Standard Specifications and SJI Technical Digest #9.

B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment until completion of erection and installation of permanent bridging and bracing.

C. Bolt connections at columns as required by OSHA Standards and Joist Manufacturer's details.

D. Coordinate placement of anchors in masonry construction for securing bearing plates and angles.

E. After alignment and installation of framing, attach joist seats to supports.

1. Type K & KCS Joists - Minimum 3/16 inch by 2 inch weld each side of seat.
2. Type LH, Joists - Minimum 1/4 inch by 2 inch weld each side of seat.
3. Welded Connections listed are minimum. See Drawings for additional details and requirements.

F. Position and field connect joist bridging, chord extensions and wall attachments as detailed.

G. Do not connect joist girder bottom chords until all dead load is in place.

H. Do not permit erection of decking until joists are braced, bridged, and secured.

I. Do not field cut or alter structural members without approval of joist fabricator and design professional.

J. After erection, clean and prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete. Use primer consistent with shop coat and/or finish coating.

3.3 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Alignment: 1/4 inch.

3.4 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Division 01 – Quality Requirements.

END OF SECTION 052100

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SECTION 053123 - STEEL ROOF DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel roof deck and accessories.
2. Framing for openings up to and including 18-inches.
3. Roof drain sump pans.

B. Related Sections:

1. Applicable provisions of Division 01 shall govern all work under this Section.
2. Section 03 31 00 – Structural Concrete: Concrete topping over metal roof deck.
3. Section 03 31 00 – Structural Concrete: Placement of anchors for bearing plates and angles cast in concrete.
4. Section 04 20 11 – Concrete Unit Masonry: Placement of anchors for bearing plates and angles embedded in masonry.
5. Section 05 12 00 - Structural Steel Framing.
6. Section 05 21 00 - Steel Joist Framing: Support framing for openings larger than 18 inches.
7. Division 22 – Plumbing: Reinforcement pans with roof drain hub assemblies.

1.2 REFERENCES

A. ASTM International (American Society for Testing and Materials)

1. ASTM A36 - Structural Steel.
2. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process.
4. ASTM A992 - Steel for Structural Shapes For Use in Building Framing.
5. ASTM A1008 – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

B. American Welding Society (AWS)

1. AWS D1.1 - Structural Welding Code.
2. AWS D1.3 - Structural Welding Code: Sheet Steel.

C. Steel Deck Institute (SDI)

1. SDI - Design Manual for Composite Decks, Form decks, Roof Decks, Cellular Metal Floor Deck with Electrical Distribution.

D. The Society for Protective Coatings (SSPC)

1. SSPC - Painting Manual. SSPC Paint No. 15, Steel Joist Shop Paint Type 1, red oxide; SSPC - 20 Type I Inorganic; and SSPC - 20, Type II - Organic.

1.3 PERFORMANCE REQUIREMENTS

A. Design metal deck in accordance with SDI Design Manual.

B. Calculate to structural working limit stress design and maximum vertical deck deflection of 1/180.

1.4 SUBMITTALS

A. Division 01 - Submittal Procedures: Submittal requirements.

B. Shop Drawings: Indicate deck plan, support locations, projections, openings and reinforcement, pertinent details and accessories, fasteners and fastener pattern diagram.

C. Product Data: Submit deck profile characteristics and dimensions, structural properties, and finishes.

D. Manufacturer's Installation Instructions: Submit manufacturer's installation instructions.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

F. Welders Certificates: Certify welders employed on Work verifying AWS qualification within previous twelve months.

1.5 QUALIFICATIONS

A. Installer: Company specializing in performing work of this Section with minimum 5 years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

A. Division 01 - Product Requirements: Product Storage and handling requirements.

B. Cut plastic wrap to encourage ventilation.

C. Site Storage: Store off ground on dry wood sleepers with one end elevated to provide positive drainage. Protect from elements with a waterproof covering, ventilated to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Epic Metals Corp.

B. United Steel Deck, Inc.

C. Vulcraft Steel Deck, Division of Nucor Corp.

D. Wheeling Corrugating Co.

E. Steel deck manufacturer and type shall be listed in the FM Global approval Guide.

F. No Substitutions permitted.

2.2 MATERIALS

A. Sheet Steel: ASTM A1008, Structural Steel (SS), Grade 33, Structural Quality; prime coated both sides.

B. Angles, Plates, and Channels: ASTM A36.

C. Fasteners: Carbon steel, self-tapping screws. Framing connections - #12 minimum; deck stitch connections - #10 minimum.

D. Welding Materials: AWS D1.1 and D1.3.

E. Shop and Touch Up Primer: SSPC, Type 1, Red or Gray oxide primer to match prime paint of roof deck.

F. Framed Openings: ASTM A36 Structural Steel; Fy = 36 ksi.

2.3 FABRICATION

A. Metal Deck: Sheet Steel, configured as follows:

1. Span Design: multiple, Triple span where possible.
2. Minimum Metal Thickness Excluding Finish: See plans.
3. Nominal Height: See plans.
4. Formed Sheet Width: 36 inches.
5. Side Joints: Lapped.
6. Flute Sides: plain vertical face.

B. Roof Sump Pan: Fabricate of 14 gage thick sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

C. Fasteners: Galvanized hardened steel, self tapping, painted to match deck pre-coating color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 - Administrative Requirements: Coordination and project conditions.

B. Verify that field conditions are acceptable and are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Erect metal deck in accordance with SDI Design Manual.

B. Bear deck on masonry support surfaces with 4 inch minimum bearing. Align and level.

C. Bear deck on steel supports with 1-1/2 inch minimum bearing. Align and level.

D. Fasten deck to steel support members at ends and intermediate supports per the structural plans.

E. Welded connections shall be in accordance with AWS D1.1 and D1.3.

F. Stitch fastening of deck shall be made with minimum #10 self-tapping screws.

G. Mechanically fasten side laps per structural plans.

H. Reinforce steel deck openings from 6 to 18 inches in size with 2 by 2 by 1/4 inch steel angles. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld or mechanically attach to deck at each flute.

I. Install 6-inch minimum wide sheet steel cover plates, of same thickness as deck, where deck changes direction. Fusion weld or Mechanically fasten 12 inches on center maximum.

J. Install sheet steel closures and angle flashing to close openings between deck and walls, columns, and openings.

K. Position roof sump pans with flange bearing on top surface of deck. Mechanically attach fasten at each deck flute.

L. Immediately after any welding of deck and other metal components in position, clean and coat welds, burned areas, and damaged surface coating, with touch-up prime paint.

END OF SECTION 053123

SECTION 055113 – METAL PAN STAIRS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with cornet-filled treads

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal stairs and landings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch (6.4 mm), whichever is less.

1.4 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product data: Submit manufacturer's standard catalog literature showing products specified.

C. Shop drawings: Submit shop drawings showing detail fabrication of steel stairs. Indicate layout, profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, fabrication and accessories. Include installation drawings, elevations, and details where applicable. Indicate welded connections using standard AWS welding symbols. Indicate net weld lengths.

D. Design data: Submit design calculations, assumptions, and applicable loads. Design shall be in accordance with applicable codes.

E. Manufacturer's certificates: Submit written statement(s) attesting that product or material conforms to or exceeds specified requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Test reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.6 CLOSEOUT SUBMITTALS

A. Warranties: Provide manufacturer warranties with requirements specified in "Warranties" article with submission of O&M manuals.

1.7 QUALITY ASSURANCE

A. All materials, methods, procedures and applications shall be in accordance with appropriate industry standards including, but not necessarily limited to, the following:

1. ASTM A36 - Structural Steel.
2. AWS D1.1 - Structural Welding Code.
3. SSPC - Steel Structure Painting Council- Paint, Oil: Iron Oxide, Ready Mix, Red and Brown.

B. Engineer Qualifications: Design Engineer must be a Professional Engineer, legally authorized to practice in jurisdiction where Project is located, and experienced in providing engineering services relative to the design of metal stairs, including handrails and railing systems, similar to this Project in material, design, and extent.

C. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code - Steel" and AWS D1.3 "Structural Welding Code - Sheet Steel."

1.8 WARRANTY

A. The Contractor shall provide a written warranty that all work furnished and installed shall be free from faulty and/or defective materials and workmanship for a period of three (3) years from the date of final acceptance.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage and handling shall be accomplished in such a manner as required to prevent damage, deterioration, or the intrusion of foreign matter. Damaged items that cannot be restored to their original condition will be rejected..

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: For surfaces exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, roughness, or, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Steel Plates, Shapes and Bars: ASTM A36.

C. Cold-Formed Steel Tubing: ASTM A500, Grade B. For exterior installations, or where indicated, provide tubing with hot-dipped galvanized coating per ASTM A53.

D. Steel Pipe: ASTM A53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads. Black finish, unless otherwise indicated.

E. Steel Bars for Gratings: ASTM A569 or ASTM A36.

F. Steel Sheets: ASTM A653 for galvanized deck and accessories.

G. Wire Rod for Grating Cross Bars: ASTM A510.

H. Rolled Steel Floor Plate: ASTM A786.

I. Uncoated Structural Steel Sheet: Cold-Rolled Structural Steel Sheet; ASTM A611, Grade A, unless otherwise indicated or required by design loading.

J. Uncoated Steel Sheet: Commercial quality, cold-rolled steel sheet; ASTM A366/A366M.

K. Galvanized Steel Sheet: Commercial quality; ASTM A526, G 90(Z 275) coating designation, unless otherwise indicated.

L. Fasteners:

1. Bolts and Nuts: hexagon-head type, ASTM A307, Grade A; with hex nuts, ASTM A563, and where needed, flat washers.
2. Lag Bolts: ANSI B18.2.1 (B18.2.3.8M).
3. Expansion Anchors: Anchor bolt and sleeve assemblies with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E488.
4. Provide plated fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls.

M. Shop Primer: Fast-curing, lead and chromate-free, universal modified alkyd primer complying with FS TT-P-664, for shop application and field touch-up.

N. Welding Materials: AWS D1.1; type required for materials being welded.

O. Grout: Nonshrink, nonmetallic grout complying with ASTM C1107. For exterior and interior applications, provide specific grout products recommended by manufacturer.

P. Concrete Materials and Properties (for concrete fill): Comply with requirements in specification section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa) unless otherwise indicated.

2.2 STAIR FABRICATION

A. Verify dimensions on site prior to shop fabrication.

B. Fabricate steel stair assemblies as indicated on Drawings and as accepted on shop drawings. Preassemble in shop to greatest extent possible to minimize field splicing and assembly.

C. Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM "Metal Stair Manual" for commercial class of stairs

D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Fabricate items with joints tightly fitted and secured.

E. At exposed welded connections, grind exposed welds smooth and flush so welded surface matches adjoining surfaces. Ease exposed edges to a radius of approximately 1/32 inch. Form bent-metal corners to smallest radius possible without impairing work.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible.

G. If exposed mechanical fasteners are unavoidable, provide flush countersunk screws or bolts; unobtrusively located; consistent with design of structure, except where specifically noted otherwise.

H. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, unless specifically noted otherwise.

I. Metal-Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements but not less than 0.067 inch (1.7 mm).

1. Steel Sheet: Uncoated cold-rolled steel sheet unless otherwise indicated.
2. Steel Sheet: Galvanized-steel sheet, where indicated.
3. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
4. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
5. Shape metal pans to include nosing integral with riser.
6. Attach abrasive nosings to risers.
7. At Contractor's option, provide stair assemblies with metal-pan subtreads filled with reinforced concrete during fabrication.
8. Treads in subparagraphs below are an alternative to prefilled concrete treads.
9. Provide epoxy-resin-filled treads, reinforced with glass fibers, with slip-resistant, abrasive surface.
10. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.3 FINISH

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Prime paint metal stairs after assembly with one coat shop primer.

C. Apply shop primer to uncoated surfaces except those with a galvanized finish or those to be in direct contact bond with concrete, sprayed-on fireproofing, or masonry, or where field welding is required.

PART 3 - EXECUTION

3.1 PREPARATION

A. Obtain Architect/Engineer approval prior to any site cutting or making adjustments not scheduled.

B. Coordinate and furnish anchorages, setting templates and drawings, and instructions for installing anchorages. Coordinate delivery of such items to Project site.

3.2 INSTALLATION

A. Provide anchorage devices where necessary for securing steel stairs to in-place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts and other connectors as required.

B. Perform cutting, fitting, and drilling required for installing steel stairs. Set units accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true and free of rack.

C. Perform field welding in accordance with AWS D1.1.

D. After installation, touch-up field welds and scratched or damaged surfaces with primer.

E. Place and finish concrete fill for treads and platforms to comply with specification section "Cast-in-Place Concrete."

3.3 ADJUSTING AND CLEANING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

B. For galvanized surfaces, clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

END OF SECTION 055113

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SECTION 055213 – PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior and Exterior steel pipe and tube railings.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Railings: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails:

a. Uniform load of 0.73 kN/m (50 lbf/ ft.) applied in any direction.
b. Concentrated load of 0.89 kN (200 lbf) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Top Rails of Guards:

a. Uniform load of 0.73 kN/m (50 lbf/ ft.) applied in any direction.
b. Concentrated load of 0.89 kN (200 lbf) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

3. Infill of Guards:

a. Concentrated load of 0.22 kN (50 lbf) applied horizontally on an area of 0.093 sq. m (1sq. ft.).

1.4 ACTION SUBMITTALS

A. Product Data: Include calculations, construction details, material descriptions, dimensions metal stairs, handrails and guardrails.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation registered in the state where the project is located.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabrication without field measurements. Coordinate wall construction to ensure that actual dimensions correspond to established dimensions.

1.6 COORDINATION

A. 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.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

D. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30 (Grade 205).

2.2 FASTENERS

A. General: Provide the following:

1. Same basic metal as fastened metal; concealed, unless otherwise indicated or unavoidable, and standard with systems indicated.
2. Many fasteners, such as small diameter machine screws, are not available hot-dip galvanized.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

2.3 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

C. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.4 FABRICATION

A. Provide complete handrail/guardrail assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor handrails on supporting structure.

1. Join components by welding, unless otherwise indicated. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. At exposed connections, finish exposed welds smooth and blended.
2. Use connections that maintain structural value of joined pieces.
3. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
4. Form bent-metal corners to smallest radius possible without impairing work.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. Use connections that allow for removal and reinstallation of all railing assemblies (in segments).

C. 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.

D. Form work true to line and level with accurate angles and surfaces.

E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

F. Connections: Fabricate railings with welded connections unless otherwise indicated.

G. 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 surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

H. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

I. Close exposed ends of railing members with prefabricated end fittings.

J. Brackets, Flanges, Fittings, and Anchors: Provide flanges, miscellaneous fittings, and anchors to interconnect railing members to other work in a manner that allows railings to be removable unless otherwise indicated.

K. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure. Provide for railing assemblies to be removable.

2.5 FINISHES GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal stairs after assembly.

B. 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.

2.6 STEEL AND IRON FINISHES

A. Exterior Railings and Guardrails (Galvanized):

1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
4. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
5. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components where indicated.

2.7 Interior Railings and Guardrails:

1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed products:
2. Interior Stairs (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

3. Apply shop primer to uncoated surfaces of metal stair components. 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 EXAMINATION

A. Examine concrete substrates, to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION

A. Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

B. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete, unless otherwise indicated.

C. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. 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.

D. Attach handrails to wall with wall brackets.

E. Refer to Drawings for details indicating attachment of handrails to concrete or masonry.

F. Adjusting and Cleaning:

1. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
2. Painted surfaces:

    a. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting.
    b. Primed Surfaces: Clean field welds, bolted connections, and abraded areas and repair shop primer to comply with the recommendations of topcoat manufacturer.

3.3 WASTE MANAGEMENT

A. Collect offcuts and scrap and place in designated areas for recycling.

3.4 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.

END OF SECTION 055213

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Wood blocking, cants, and nailers.
2. Plywood backing panels.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 51 mm (2 inches) nominal or greater but less than 127 mm (5 inches) nominal in least dimension.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.2 SHEATHING

A. Plywood Sheathing: DOC PS 1 sheathing, thickness and span rating as noted on the drawings.

B. Plywood Sheathing: Exterior sheathing, thickness and span rating as noted on the drawings.

2.3 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 19 mm (3/4-inch) nominal thickness.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION 061053

SECTION 064116 – PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Plastic-laminate cabinets.
2. Solid-surfacing-material countertops.
3. Solid-surfacing material window sills.
4. Closet and utility shelving.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated, including cabinet hardware and accessories.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes for plumbing fixtures faucets soap dispensers and other items installed in architectural woodwork.

D. Color Samples for Selection and Approval by the Architect:

1. Provide manufacturer's color samples as indicated in the Architectural Finish Schedule (no substitutions) in minimum sizes of 50 mm (2-inches) x 100 mm (4-inches).

a. Plastic Laminate
b. Solid-Surfacing Material

1.5 QUALITY ASSURANCE

A. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork 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: Where woodwork is 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 woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Products: Comply with the following:

1. Hardboard: AHA A135.4.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
4. Softwood Plywood: DOC PS 1, Medium Density Overlay.
5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.

C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

E. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish.

B. Pulls: Wire pulls. Solid stainless steel wire pulls, fastened from back with two screws. For sliding doors, provide recessed stainless steel flush pulls. Provide 2 pulls for drawers more than 600 mm (24 inches) wide.

C. Hinges: Fully concealed (European style) hinges for overlay doors with 110-degree opening. Hinges to be fully adjustable with nickel finish.

D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or B05091.

E. Grommets for Cable Passage through Countertops: 32 mm (1-1/4-inch) OD, black Insert color, molded-plastic grommets and matching plastic caps with slot for wire passage.

F. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 MISCELLANEOUS MATERIALS

A. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

B. Counter Supports:6063-T6 aluminum, TIG welded, all edges ground and deburred, black powder coated finish, for surface-mounting.

1. 610 mm (24”) Shelf/Counter: Rangine Corp., Rakks Model EH-1818

2.4 FABRICATION, GENERAL

A. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 20 mm (3/4 Inch) Thick or Less: 1.6 mm (1/16 inch).

2.5 PLASTIC-LAMINATE CABINETS

A. Grade: Custom.

B. AWI Type of Cabinet Construction: As indicated.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGL.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade VGS.
4. Edges: Grade VGS.

D. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
2. Drawer Sides and Backs: Thermoset decorative panels.
3. Drawer Bottoms: Thermoset decorative panels.

E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

F. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated on the Architectural Finish Schedule, no substitutions.

2.6 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Grade: Custom.

B. Solid-Surfacing-Material Thickness: 1/2 inch.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:

1. As indicated on the Architectural Finish Schedule, no substitutions.

D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

E. Install integral sink bowls in countertops in shop.

F. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

2.7 SOLID-SURFACING-MATERIAL WINDOW SILLS

A. Grade: Custom.

B. Solid-Surfacing-Material Thickness: 1 inch.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:

1. As indicated on the Architectural Finish Schedule, no substitutions.

D. Fabricate in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

2.8 CLOSET AND UTILITY SHELVING

A. Grade: Custom.

B. Shelf Material: 20 mm (3/4-inch) High-Pressure Decorative Laminate Grade: HGS on all exposed surfaces.

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. As indicated on the Architectural Finish Schedule, no substitutions.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 3.2 mm in 2420 mm (1/8 inch in 96 inches).

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Cabinets: Install without distortion so doors and drawers fit openings properly 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.

1. Install cabinets with no more than 3.2 mm in 2420-mm (1/8 inch in 96-inch) sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 3.2 mm in 2420 mm (1/8 inch in 96-inch) sag, bow, or other variation from a straight line.
3. Caulk space between backsplash and wall with sealant suitable for application.

    a. Caulk Color: Clear.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean exposed and semi-exposed surfaces

END OF SECTION 064116

SECTION 066400 – FIBERGLASS REINFORCED PLASTIC PANELS (FRP)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated.

C. Samples for Initial Selection: For plastic paneling.

1.4 QUALITY ASSURANCE

A. Source Limitation: Obtain plastic paneling and trim accessories from single manufacturer.

B. Surface-Burning Characteristics: As determined by testing Identical products according to ASTM E 84 by a qualified testing agency. Indentify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less
3. Testing Agency: UL

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PLASTIC SHEET PANELING

A. General: Corrugated polypropylene core with a fiberglass reinforced plastic face panels complying with ASTM D 5319.

1. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

a. Nudo Products, Inc.; FiberCorr

2. Nominal Thickness: Not less than 0.400 inch.
3. Surface Finish: Molded pebble texture.
4. Color: As selected by Architect from manufacturer's full range.

2.2 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: Match panels.

B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.

C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

D. Adhesives: As recommended by plastic paneling manufacturer.

E. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half of full panels, unless otherwise indicated.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Installing panels in a full spread of adhesive.

C. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.

1. Drill oversized fastener holes in panels and center fasteners in holes.
2. Apply sealant to fastener holes before installing fasteners.

D. Install factory-laminated paneling using concealed mounting splines in panel joints.

E. Install trim accessories with adhesive and nails or staples. Don fastener through panels.

F. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

G. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

H. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

I. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with dry cloths until no residue remains.

END OF SECTION 066400

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SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Building Insulation:

a. Below grade foam-plastic board insulation.
b. Rainscreen cavity wall foam-plastic board insulation.
c. Natural cotton blanket insulation (mold resistant).
d. Vapor retarders.

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide insulation possessing the surface burning characteristics indicated, determined by testing identical products in accordance with test method ASTM E 84.

B. Thermal Resistance: Shall be 5 year aged R-value determined by testing in accordance with test method ASTM C 518.

C. Testing and Labeling: Shall be by Underwriters Laboratories or another testing and labeling agency acceptable to the Contracting Officer's Representative. All insulation shall be identified with appropriate markings of applicable testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.

3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 BELOW GRADE FOAM-PLASTIC BOARD INSULATION

A. Manufacturers and Products:

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

    a. DiversiFoam - CertiFoam 25 SE
    b. Dow - STYROFOAM™ Brand Square Edge Insulation
    c. Owens Corning - FOAMULAR® 250

B. Characteristics:

1. Material: Extruded-polystyrene board (XPS) insulation
2. R-value per 25mm (Inch) per ASTM C518: 5.4 at 4.4ºC (40ºF) / 5.0 at 23.8ºC (75ºF)
3. Fire Rating per ASTM E 84: Class B – Flame spread / Smoke developed
4. Type and Minimum Compressive Strength per ASTM C 578: Type IV, 173 kPa (25 psi).
5. Water Absorption Maximum: Three-tenths (0.3) percent, volume
6. Board Edges: Square
7. Thickness: 51 mm (2 inches), unless noted otherwise on drawings.
8. Application:

    a. Below concrete slab-on-grade.
    b. Perimeter foundation wall.

2.2 RAINSCREEN CAVITY WALL FOAM-PLASTIC BOARD INSULATION

A. Manufacturers and Products:

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

    a. The Dow Chemical Company; STYROFOAM™ Brand CAVITYMATE™ Ultra Extruded Polystyrene Foam Insulation
    b. Owens Corning: FOAMULAR® High-R CW Plus Extruded Polystyrene (XPS) Rigid Foam Insulation.

B. Characteristics:

1. Material: Extruded-polystyrene board (XPS) insulation
2. Long Term Thermal Resistance (LTTR) R-value: 5.6 per inch (25 mm)
3. Fire Rating per ASTM E 84 – Flame spread / Smoke developed: 0/155
4. Minimum Compressive Strength per ASTM C D1621: 25 psi.
5. Maximum Water Absorption by Volume per ASTM D2842: (0.7) percent
6. Board Edges: Square

7. Thickness: 2 1/8 inches (54-mm), unless noted otherwise on drawings.
8. Application:

    a. Rainscreen cavity wall construction.

2.3 NATURAL COTTON BLANKET INSULATION

A. Manufacturers:

1. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

    a. Bonded Logic, Inc.; UltraTouch Natural Cotton Fiber Insulation.

2. R-value: 3.5 Inch = R-13, 5.5 Inch = R-19, 8.0 Inch=R-30.
3. Fire Rating: Flame Spread – 5 (Class A), Smoke Developed – 35 (Class-A).
4. Fire Rating: 1-Hour.
5. Mold/Mildew/Fungi Resistance: Pass-No Growth (ASTM C 739).
6. Corrosion Resistance: Pass (ASTM C 739).
7. Odor Emission: Pass (ASTM C 739).
8. Moisture Absorption: Pass – Less than 15% (ASTM C 739).
9. Environmentally safe, sustainable, non-allergenic, non-hazardous, non-formaldehyde, non-itch insulation product.

10. Application:

    a. All exterior steel stud walls.
    b. All interior steel stud partitions (sound attenuation).

2.4 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

C. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF FOAM PLASTIC BOARD INSULATION

A. Provide friction fit installation to depth indicated on drawings using 50 mm (2-inch) thick board insulation. Stagger joints between each layer a minimum of 457 mm (18”) in each direction where feasible. Tape all exposed joints.

3.4 INSTALLATION OF INSULATION FOR METAL FRAMED CONSTRUCTION

A. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 80 mm (3-inch) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 2420 mm (96 inches), support unfaced blankets mechanically.

3.5 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Glass-Fiber Blanket Insulation: Where blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated or 200 mm (8 inches) minimum.

3.6 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.

1. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.7 PROTECTION, GENERAL

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

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SECTION 072726 – FLUID-APPLIED MEMBRANE AIR BARRIER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes fluid-applied, air/vapor/moisture barriers.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air, water vapor and moisture.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air, water vapor and moisture movement through the wall.

1.4 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. 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.

C. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
2. Include details of interfaces with other materials that form part of air barrier.

D. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.

E. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Warranties: Provide material and installation warranties as required in “Warranty” Article of this specification section.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

C. Manufacturer: Obtain primary materials from a single manufacturer regularly engaged in manufacturing air and vapor barrier membranes. Obtain secondary materials from a source acceptable to the primary materials manufacturer.

D. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing Work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up, sequence of construction, coordination with substrate preparation, materials approved for use, compatibility of materials, coordination with installation of adjacent and covering materials, and details of construction. Attendance is required by representatives of related trades including covering materials, substrate materials and adjacent materials.

1.8 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Review air-barrier requirements and installation, special details, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air and vapor barrier membrane manufacturer. Protect stored materials from direct sunlight.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Handle materials in accordance with manufacturer's recommendations.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.

2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

1.11 WARRANTY

A. Material Warranty: Provide manufacturer's standard product warranty, for a minimum 3 years from date of Substantial Completion.

B. Installation Warranty: Provide installer's 2 year warranty from date of Substantial Completion, including all components of the air and vapor barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.3 FLUID-APPLIED MEMBRANE VAPOR/MOISTURE/ AIR BARRIER

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Synthetic Polymer Membrane:

a. Grace, W. R., & Co. - Conn.; Perm-A-Barrier Liquid.
b. Henry Company; Air-Bloc 32.
c. Rubber Polymer Corporation, Inc.; Rub-R-Wall Airtight.

B. Physical and Performance Properties:

1. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
2. Vapor Permeance: Maximum 0.1 perm (5.8 ng/Pa x s x sq. m); ASTM E 96/E 96M.
3. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Counterflashing Strip: Modified bituminous, 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil- (0.2-mm-) thick, cross-laminated polyethylene film with release liner backing.

D. Modified bituminous self-adhering strip in "Modified Bituminous Strip" Paragraph below is used to terminate air barrier to compatible roofing membranes. Verify compatibility with roofing membranes and revise strip material if necessary.

E. Modified Bituminous Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

F. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.

G. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

H. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

I. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft (24- to 32-kg/cu. m) density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

J. Modified Bituminous Transition Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

K. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- (0.43mm-) thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance value of 37 perms (2145 ng/Pa x s x sq. m).

L. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dow Corning Corporation; 123 Silicone Seal.
    b. Momentive Performance Materials Inc.; US11000 UltraSpan.
    c. Pecora Corporation; Sil-Span.
    d. Tremco Incorporated, an RPM company; Spectrem Simple Seal.

M. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."

N. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

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 by plastic sheet method according to ASTM D 4263.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions. Mask open eyes of masonry ties as necessary to properly receive veneer ties.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

B. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches (75 mm) along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

3.4 TRANSITION STRIP INSTALLATION

A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip, or elastomeric flashing sheet so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
2. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches (150 mm) o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

I. Seal top of through-wall flashings to air barrier with an additional 6-inch- (150-mm-) wide, modified bituminous strip.

J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches (150 mm) beyond repaired areas in strip direction.

3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.

1. Apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.

1. Vapor-Retarding Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil (1.0-mm) dry film thickness, applied in one or more equal coats.

C. Apply strip and transition strip a minimum of 1 inch (25 mm) onto cured air-barrier material or strip and transition strip over cured air-barrier material overlapping 3 inches (75 mm) onto each surface according to air-barrier manufacturer's written instructions.

D. Do not cover air barrier until it has been tested and inspected by testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall engage a qualified testing agency to perform tests and inspections.

B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.

11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

C. Tests: As determined by testing agency from among the following tests:

1. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E 783.
2. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion of 30 lbf/sq. in. (207 kPa) according to ASTM D 4541 for each 600 sq. ft. (56 sq. m) of installed air barrier or part thereof.

D. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.7 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 073364 – MODULAR VEGETATED ROOF SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install vegetative roof system, including:

1. System manufacturer's requirements for the specified warranty.
2. Preparation of roofing substrates (by reference).
3. Pregrown modules.
4. Drain inspection chambers, four total.
5. Edge flashing.
6. Irrigation.
7. Piping.
8. Wiring.
9. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete modular vegetative roof system.

B. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.

C. Comply with the published recommendations and instructions of the roofing membrane manufacturer.

D. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.2 RELATED SECTIONS

A. Section 075323 - Membrane Roofing. **SEE SYSTEM AND WARRANTY REQUIRMENTS.**

1.3 REFERENCES

A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.

1. ASTM C578-04a, Rigid Cellular Polystyrene Thermal Insulation.
2. ASTM E2399-05, Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems.
3. ASTM E2397-05, Standard Practice for determination of Dead Loads and Live Loads associated with Green Roof Systems.
4. ASTM E2400 - 06 Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems

5. ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM D7003-03, Standard Test Method for Strip Tensile Properties of Reinforced Geo-membranes.
7. ASTM D7004-03, Standard Test Method for Grab Tensile Properties of Reinforced Geomembranes.
8. ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
9. ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
10. ASTM D751-06, Standard Test Methods for Coated Fabrics.
11. ASTM C518-10, Standard Test Method for Steady State Thermal Transmission Properties by Means of the Heath Flow Meter Apparatus.
12. ASTM D1621-10, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
13. ASTM C272-01, Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
14. ASTM D4632-08, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
15. ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
16. ASTM D4833-07, Standard Test Method for Index Puncture Resistance of Geo-membranes and Related Products.
17. ASTM D6241-04(2009), Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile Related Products Using a 50 mm Probe.
18. ASTM D3786/D3786M-09, Standard Test Method for Bursting Strength of Textile Fabrics Diaphragm Bursting Strength Tester Method.
19. ASTM D4355-99, Standard Test Method for Deterioration of Geotextiles by Exposure to Ultraviolet Light and Water (Xenon Arc Type Apparatus).
20. ASTM D4491-99a, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
21. ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
22. ASTM D5261-10, Standard Test Method for Measuring Mass per Unit Area of Geotextiles.
23. ASTM D5199-12, Standard Test Method for Measuring the Nominal Thickness of Geo-synthetics.
24. ASTM D5035-11, Standard Test Method for Breaking Force and Elongation of Textile Fabric (Strip Method).

B. German Landscape Research, Development and Construction Society (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau, FLL).

1. 2002 German FLL Guidelines for the Planning, Development, and Maintenance of Green Roofs.

C. Occupational Safety and Health Adminisration (OSHA). Material Safety Data Sheets (MSDS) (where applicable; not required for articles).

1.4 SYSTEM DESCRIPTION

A. Vegetative Roof System:

1. Root barrier, not required.
2. Drain inspection chambers, four total.
3. Pregrown Modules
4. Edge Flashing,

B. The Vegetative Roof System shall be composed of a single-media system of fully integrated living and manufactured components which form a continuous cover over the designated roofing area.

C. All components of the vegetative roof system must be provided by the roofing system manufacturer under a single, sole-sourced warranty for both roofing system and vegetative roof system. See specification section 07 53 23 for all warranty requirements that include this specification section product listings.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

A. Submit samples, Technical Information Sheets and MSDS sheets of each product specified.

B. Submit testing data from an Agricultural Analytical Services Laboratory. Testing should be no more than one (1) year from the date of submission.

C. Submit testing data from a certified laboratory of the growing media as per ASTM E2399-05. Testing should be no more than three (3) months from the date of submission.

D. Samples: Submit two (2) samples of each component in the vegetative roof system.

E. Manufacturer's Certificate: signed by the Vegetative Roof System Manufacturer verifying that the Installer is approved, authorized or licensed by Manufacturer to install specified products.

F. Installer's Certificate: a letter, on company letterhead, signed by Installer verifying they have the specified qualifications described.

G. Division 01 Quality Control: maintenance reports.

1. Reports: must be submitted quarterly, must be signed by an approved representation of Contractor/Subcontractor, and must outline actions carried out as per maintenance requirements.

1.6 QUALITY ASSURANCE

A. Contractor/Subcontractor must have proven experience installing vegetative roof systems of a similar nature.

B. Contractor/Subcontractor must have trained staff to facilitate maintenance of vegetative roof/system.

C. Contractor/Subcontractor must be certified by manufacturer of vegetated roof system.

D. All employees of Contractor/Subcontractor must maintain Fall Arrest Certificates on their person at all times while working on roof top.

1.7 QUALIFICATIONS

A. Manufacturer: company specializing in supplying of vegetative roof systems with 5 years of experience.

B. Preference will be given to those system providers which produce their products from local sources.

C. Installer: company approved by membrane and vegetative roof system manufacturer.

1.8 INSPECTION AND TESTING

A. Product test reports: based on evaluation of comprehensive tests conducted by an independent testing agency of the specified products.

B. Manufacturer field inspection reports: Manufacturer's written acceptance of vegetative roof system installation based on manufacturer's standard inspections.

1.9 PERFORMANCE REQUIREMENTS

A. Growing media must meet FLL Guidelines for extensive media.

B. Bulk density of growing media must be less than or equal to 32 lb. /ft^2. Calculations must be based on maximum media density at saturation of growing media per ASTM E2399-05.

C. Minimum dry weight of the growing media must be more than or equal to 18 lb. /ft^2. Calculations must be based on dry weight of growing media per ASTM E2399-05.

D. Entire vegetative roof system must retain at least 1.1 US gallons/ft^2 of water. Calculations must include volume of water represented by difference in weight between dry and saturated weight of the growing media per ASTM E2399-05.

E. Growing media must have a Saturated Hydraulic Conductivity of greater than 15 inch/hour per ASTM E2399-05.

F. All growing media must be produced within a 500 mile radius of project site.

G. All growing media must be such that it does not require an irrigations system in Madison, WI climate.

H. All materials involved in the making of the growing media must be from recycled products.

I. All vegetation must be verified for compatibility by the Growing Media Manufacturer prior to acceptance.

1.10 MOCK-UP

A. Provide mock-up of modular vegetated roof membrane assembly and associated components and accessories.

B. Mock-up Size: 3 units wide x 3 units long separator sheet, drain inspection chambers, pre-vegetated modules, edging, irrigation, roof pavers; at location designated.

C. Mock-up may remain as part of the Work.

1.11 PRE-INSTALLATION MEETINGS

A. Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Division 01 - Construction Progress Schedule - Critical Path Method (CPM).

1. Meeting: prior to commencement of roof installation, review and document methods and procedures related to roof deck and roofing system construction, including:
2. Participants: authorized representatives of Contractor, Construction Manager, Owner, Consultant, Roofing Subcontractor, Roofing System/Vegetative Roof System Manufacturer, and Vegetative Roof System Installer.

    a. Review methods and procedures relating to vegetated roofing assembly, including Manufacturer's written installation instructions.
    b. Review construction schedule and confirm availability of products, Subcontractor personnel, equipment and facilities.
    c. Review roofing membrane type and system for conformance with vegetated assembly criteria.
    d. Review structural loading limitations of roof deck and identify temporary loading areas for storage.
    e. Review flashing details, roofing details, drains, penetrations, equipment curbs, and other conditions affecting vegetated system assembly.
    f. Review governing regulations, insurance and/or certificates where required.
    g. Review safety requirements, including fall arrest measures.
    h. Review field quality control procedures and review no-smoking policy.
    i. Prior to commencement of work obtain from the EFVM Contractor a report certifying the roof is watertight.
    j. Prior to commencement of work obtain a structural report from Consultant certifying dead load weight restrictions for the entire assembly.
    k. Prior to commencement of work, ensure coordination with related work specified in other Sections.
    l. Minutes of each meeting must be taken by a representative of Consultant and distributed to all parties within 24 hours of the meeting date.
    m. Review limits of traffic by other trades on vegetated assembly and outline procedures for compensation due to damage.
    n. Review procedure for Manufacturer's inspection visit to assess compatibility with warranty requirements.
    o. Contractor must complete a photographic record of site prior to commencement.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store Products in original packaging with Manufacturer's labels and materials list intact and signed off.

B. Store Products in designated weather protected areas, elevated from ground and protected from environmental damage.

C. Avoid storage of modules on site to prevent contamination. Install modules immediately upon delivery to site.

1.13 ENVIRONMENTAL REQUIREMENTS

A. Pregrown modules must be installed according to optimal conditions, conducive to plant establishment and survival.

B. Traffic is prohibited on vegetative roof system during the establishment period.

1.14 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Warranty: Provide Warranty Rider to EPDM roof system (20 yr) Warranty, plants, irrigation system (if applicable), and other manufacturer provided system accessories.

1. Materials: Filter layer, retention layer, drainage layer, root barrier, and/or slip sheet, will not deteriorate to the point of failure due to weathering. Plants properly installed in engineered growth medium will cover no less than 80% of their original installed coverage area for a period of thirty (30) days from the date of installation.
2. Overburden: Provide for the removal and replacement of System components as necessary to expose the system for inspection and/or repair of leaks in a roofing system.
3. 24-Month Plant Coverage: If the system vegetation does not cover at least 50% of the garden roof area twelve (12) months from the date of installation, and at least 80% of the garden roof area twenty-four (24) months from the date of installation, manufacturer will take such steps to restore plant coverage to the stated percentages.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. SkyScape Pregrown Modular System by Firestone Building Products
2. Columbia Green
3. Live Roof

2.2 MATERIALS

A. Pregrown Modules:

1. Modular unit must include a permanent drainage/water retention layer, above which is situated an integrated filter cloth barrier.

2. Module must include a built-in positive locking mechanism to attach the modules together along all four sides, without creating overlapping at the top of adjacent modules (passive lap joints to connect modules are unacceptable).
3. Modules must utilize perforated sidewalls for soil to soil contact for the entire depth of the growth media.
4. Growing media: meets FLL Guidelines for extensive media as tested by an Agricultural Analytical Services Laboratory.
5. Pregrown mix of sedums as defined on the Landscape drawings.
6. Depth of growing media: 4-6 inches, pending review of final proprietary systems. System depth must be able to grow without irrigation.

2.3 ACCESSORIES

A. Drain Inspection Chambers:

1. Material: aluminum, form bent from solid sheet.

a. Must be perforated at the drainage course level to allow for free drainage and solid at the growing layer to prevent rooting and plant growth through the edging.

2. Height: 1" higher than the finished growing medium height.
3. Shape: box-shaped, with a solid lid fitted with locking mechanisms.

B. Edge Flashing:

1. Material: extruded aluminum edging.
2. Must be perforated at the drainage course level to allow for free drainage and solid at the growing layer to prevent rooting and plant growth through the edging.
3. Shape: L-Shaped
4. Drainage hole radius: ¾".

PART 3 - INSTALLATION

3.1 EXAMINATION

A. Examine surfaces and report any adverse conditions which may negatively impact appearance or performance of vegetated roof system. Ensure all unacceptable conditions are corrected before proceeding.

B. Ensure adequate provisions have been made for loading, unloading, storage, parking and access to roof site.

C. Execute work in accordance with the specification, drawings and details.

D. Report any imbedded object or obvious damage to Consultant.

E. Ensure all equipment is in good working order. Protect all equipment which comes into contact with roofing membrane, flashings and related work.

F. Ensure adequate safety equipment has been obtained for all operations.

3.2 SYSTEM INSTALLATION

A. Seperator Sheet: 45 mil EPDM membrane:

1. Install seperator sheet continually over finished membrane surface to receive modular vegetated roof system.
2. Overlap all side and end laps a minimum of 4” and allow for separator sheet to reach up all verticals 1” above the intended soil line and secure.

B. Inspection Chambers:

1. Install inspection chamber centered over drains, ensuring that the bottom inner edge of the chamber is outside of the outer edge of the drain flange.

C. Pregrown Modules:

1. Install modules on roof surface, working top to bottom and left to right while locking modules together. Modules should be installed according to the layout provided by the designer in the project construction drawings.
2. (when drain inspection chambers are used) Secure the modules to the inspection chamber using screw in accordance with Manufacturer’s literature and instructions.

D. Edging:

1. Install edging along perimeter border between vegetation-free area and vegetated area.
2. Remove locking tabs of pregrown module to be flush with module wall prior to securing edging.
3. Apply Manufacturer’s tape to the outside of all modular walls abutting the vegetation-free zone along the perimeter.
4. Ensure lip of edging is over the top edge of the modular sidewall. Position edging firmly against sidewalls of pregrown modules.

3.3 FIELD QUALITY CONTROL

A. Contractor/Subcontractor must have 5 years proven experience installing vegetative roof systems of a similar nature, or must have on-roof supervision by Manufacturer’s representative.

B. Contractor/Subcontractor must have trained staff to facilitate maintenance of vegetative roof system.

C. Contractor/Subcontractor must be certified by manufacturer of vegetated roof system.

D. All employees of Contractor/Subcontractor must maintain Fall Arrest Certificates on their person at all times while working on roof top.

E. Require site attendance of roofing materials manufacturer’s representative during installation of Work.

F. Field quality control is under control of Contractor.

G. Correct identified defects or irregularities.

3.4 VERIFICATION

A. Verification requirements in accordance with Section 01 Sustainable Requirements: Contractor's Verification, include:

1. Materials and resources. Storage and collection of recyclables.
2. Construction waste management.
3. Resource reuse.
4. Recycled content.
5. Local/regional materials.
6. Low-emitting materials.

3.5 OPERATION REQUIREMENTS

A. Operational requirements include:

1. Cleaning materials and schedules.
2. Repair and maintenance materials and instructions.

3.6 CLEANING

A. Gather and dispose all debris upon completion of work of this section.

B. Clean all surfaces and inspect final assembly for approval.

3.7 REPORTS

A. Submit maintenance reports quarterly to Owner and Vegetative Roof System Manufacturer (to maintain warranty).

B. Maintenance reports must be signed by an approved representative of Contractor and/or Subcontractor.

C. Maintenance reports must outline actions carried out in accordance with maintenance requirements of this specification, as well as dates, personnel at each visit and notes on growing conditions.

D. Subcontractor not conforming to the above maintenance requirements will be replaced, however, will still be held responsible for the results and costs of the replacement Subcontractor.

END OF SECTION 073364

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SECTION 074213 – METAL WALL PANELS (MP-3 WALL PANELS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concealed-fastener, lap seam metal wall panels used as a rainscreen designated as MP-1 wall panels on the drawings.
2. Accessories including carrier rails, hat-channel, fasters, flashings, and perimeter trim.

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.

C. Shop Drawings: Show fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish between factory-, shop- and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):

a. Flashing and trim.
b. Anchorage systems.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Sample in first subparagraph below may be difficult to obtain if custom color is specified.
2. Metal Wall Panels: 2-inch x 3-inch color chips indicating selected finish color on actual panel material. Include fasteners, closures, and other metal wall panel accessories.
3. Trim and Closures: 12 inches (305 mm) long. Include fasteners and other exposed accessories.
4. Qualification Data: For Installer

E. Warranties: Sample of special warranties.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:

1. Wall panels and attachments.
2. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
3. Penetrations of wall by pipes and utilities.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal wall panels to include in maintenance manuals.

B. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Installer: Pre-Qualified Company specializing in performing the work of this Section shall install the system in strict compliance with the written "Installation Guide."

B. Source Limitations: Obtain each type of metal wall panel from single source from single manufacturer.

C. Installation Conference: Conduct conference at Project Site.

1. Meet with Owner, Architect, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels, including installers of doors, windows, and louvers.

    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. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
    c. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
    d. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
    e. Review temporary protection requirements for metal wall panel assembly during and after installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling. Store and handle in strict compliance with manufacturer's

instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage. Do not store panels horizontally. Always store vertically with top of panel down.

C. Store covered with suitable weather tight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Remove strippable protective covering on metal wall panel just prior to panel installation.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

1.9 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, aluminum curtainwall systems and construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

A. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show 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 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required. Thickness per the requirements of the project as determined by manufacturer.

1. Surface: flat finish.
2. Exposed Coil-Coated Finish:

    a. Metallic Fluoropolymer: AAMA 620. 3-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray 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.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2 AIR BARRIER/VAPOR RETARDER

A. See specification section 072726 “Fluid-Applied Membrane Air Barriers”.

2.3 THERMAL INSULATION

A. Rainscreen Cavity Wall Foam Plastic-Board Insulation: See specification section 072100 – Thermal Insulation.

2.4 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Subgirts: Manufacturer's standard C- or Z-shaped sections, 0.064-inch (1.63-mm) nominal thickness.

C. Zee Clips: 0.079-inch (2.01-mm) nominal thickness.

D. Base or Sill Angles or Channels: 0.079-inch (2.01-mm) nominal thickness.

E. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.5 MISCELLANEOUS MATERIALS

A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.6 CONCEALED-FASTENER, RAINSCREEN METAL WALL PANELS

A. General: Provide factory-formed metal wall panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using exposed fasteners in side laps. Include accessories required for weathertight installation. Single skin metal wall panels fabricated from single sheets of metal formed into a dry-joint pressure equalized rainscreen system with interlocking gutter and drainage system integral to the panel with single horizontal attachment to complete a dry-joint rainscreen assembly. The use of secondary drainage channels, brackets, support pins, joint sealants or gaskets to manage the drainage of the system are not allowed.

B. Manufacturers and Products

1. Basis-of Design Manufacturer and Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Morin, a Kingspan Group Company; Integrity Series Wall Panels, Profile S-16

C. Panel Description: Concealed fastener wall panel.

1. Material: Aluminum
2. Panel Depth: 7/8-inch (22-mm)
3. Cover Width: 16-inches (406-mm)
4. Gauge: 18
5. Color: As selected by Architect from manufacturer' full range of colors

    a. Basis-of-Design Color: Morin; Chromium Gray

D. Formed with horizontal panel edges and formed with alternating ribs spaced across width of panel.

E. Pre-formed Metal Corners

2.7 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings,

sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Provide pre-formed metal corners.

B. Flashing and Trim: Formed from 0.018-inch (0.46-mm) minimum thickness, aluminum sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, fasciae, parapet caps, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

1. Refer to Drawings for custom shapes and trim pieces to be fabricated from materials to match metal wall panels.

2.8 FABRICATION

A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.9 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 and painted 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

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 metal wall panel manufacturer.
2. Verify that membrane air barrier has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.3 THERMAL INSULATION INSTALLATION

A. Rainscreen Cavity Wall Foam Plastic-Board Insulation: Extend insulation in thickness indicated to cover entire wall. Comply with installation requirements in Section 072100 “Thermal Insulation.”

B. Erect insulation horizontally and hold in place with metal furring members spaced 24 inches (610 mm) o.c. Attach furring members to substrate with screws spaced 24 inches (610 mm) o.c.

C. Retain insulation in place by metal clips and straps or integral pockets within panels, spaced at intervals according to insulation manufacturer's instructions. Maintain cavity width between insulation and metal wall panel of dimension indicated.

3.4 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels according to manufacturer's written instructions and approved submittals in orientation, sizes, and locations indicated on Drawings. Install panels parallel to girts and subgirts unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Commence metal wall panel installation
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Flash and seal metal wall panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
4. Install screw fasteners in predrilled holes.
5. Locate and space fastenings in uniform vertical and horizontal alignment.
6. Install flashing and trim as metal wall panel work proceeds.
7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
8. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
9. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
10. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners:

1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized steel fasteners for surfaces exposed to the interior.

C. Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system factory-formed, metal plate wall panels fabricated from single sheets of metal formed with interlocking gutter and drainage system integral to the panel with single horizontal attachment to complete dry-joint rainscreen assembly. The use of secondary drainage channels, brackets, support pins, joint sealants or gaskets to manage the drainage of the system are not allowed. Attach metal plate wall panels in a progressive interlocking method by engaging bottom of panel in top of previous panel working left to right.

1. Install metal plate wall panels with single top attachment in pre-punched holes to allow individual panels to free-float. Do not fasten perimeter of panel or compromise internal gutter.
2. Do not apply sealants to joints unless otherwise indicated on Drawings at dissimilar materials.

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of 1/4 inch in 20 feet, non-cumulative, on level, plumb, and location lines as indicated.

3.7 CLEANING AND PROTECTION

A. On completion of metal wall panel installation, clean finished surfaces as recommended by metal wall panel manufacturer. Maintain in a clean condition during construction.

B. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213

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SECTION 074243 – ALUMINUM-FACED COMPOSITE WALL PANELS (MP-1 WALL PANELS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concealed-fastener, lap seam aluminum-faced composite wall panels used as a rainscreen designated as MP-2 wall panels on the drawings.
2. Accessories including carrier rails, hat-channel, fasters, flashings, and perimeter trim.

B. Section includes a rout and return dry gasketed aluminum-faced composite wall panel system.

1.3 DEFINITION

A. Aluminum-faced Composite Wall Panel Assembly: Aluminum-faced composite wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-faced composite wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design aluminum-faced composite wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Air Infiltration: Air leakage through assembly of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) of wall area when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

D. Water Penetration Under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

E. Structural Performance: Provide aluminum-faced composite wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:

   a. Uniform pressure of 20 lbf/sq. ft., acting inward or outward.
   b. Uniform pressure as indicated on the Drawings.

2. Deflection Limits: Aluminum-faced composite wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/175 of the span at the perimeter and 1/60 of the span anywhere in the panel of the span.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C,), ambient; 180 deg F (100 deg C), material surfaces.

G. Fire-Retardant Core: Noncombustible, with the following surface-burning characteristics as determined by testing identical products per Modified ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Spread Index: 0.
2. Smoke-Developed Index: 0.
3. No Surface Flaming (ASTM E162)
4. No Flame Spread along interior face or penetration through wall assembly (UBC 26-3)

H. Bond Integrity: When tested for bond integrity, in accordance with ASTM D1781-76 simulating resistance to panel delamination), there shall be no adhesive failure of the bond (a) between the core and the skin nor (b) cohesive failure of the core itself below the following values:

1. Bond Strength: 214 psi (vertical pull)
2. Peel Strength: 22.5 in lb./in. as manufactured
   22.5 in lb./in. after 8 hours in water at 200F
   22.5 in lb./in. after 21 days soaking in water at 70F

1.5 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of aluminum-faced composite wall panel and accessory.

C. Shop Drawings: Show fabrication and installation layouts of aluminum-faced composite wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):

a. Flashing and trim.
rage systems.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Aluminum-faced Composite Wall Panels: Minimum 12 x 12 inches (300 x 300 mm). Include fasteners, closures, and other aluminum-faced composite wall panel accessories.

a. Composite Panels: Include four-way joint.

2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch- (300-mm-) long Samples for each type of accessory.
4. Exposed Gaskets: 12 inches (300 mm) long.
5. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of aluminum-faced composite wall panels adjacent to joint sealants.

E. Delegated-Design Submittal: For metal-faced aluminum-faced composite wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: For Installer.

G. Samples of special warranties.

1.6 INFORMATION SUBMITTALS

A. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:

1. Aluminum-faced composite wall panels and attachments.
2. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
3. Penetrations of wall by pipes and utilities.

B. Qualification Data: For professional engineer and testing agency.

C. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

E. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-faced composite wall panels to include in maintenance manuals.

B. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator and installer shall assume responsibility for all components of the system and shall demonstrate no less than 10 years successful experience in aluminum-faced composite wall panel system fabrication.

B. Fire-Resistance Ratings: Where indicated, provide aluminum-faced composite wall panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Source Limitations: Obtain each type of aluminum-faced composite wall panel from single source from single manufacturer.

D. Installation Conference: Conduct conference at Project Site.

1. Meet with Owner, Architect, aluminum-faced composite wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels, including installers of doors, windows, and louvers.

    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. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
    c. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
    d. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
    e. Review temporary protection requirements for metal wall panel assembly during and after installation.

E. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact joint sealants to joint-sealant manufacturers for testing indicated in subparagraphs below:

1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

    a. Perform tests under environmental conditions replicating those that will exist during installation.

2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule enough time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical corner panel as shown on Drawings; approximately 200 SF by full thickness, including supports, attachments, and accessories.

    a. Include four-way joint for aluminum-faced composite wall panels.

2. Conduct water-spray test of mockup of aluminum-faced composite wall panel assembly, testing for water penetration according to AAMA 501.2.

G. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

H. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, aluminum-faced composite wall panels, and other manufactured items so as not to be damaged or deformed. Package aluminum-faced composite wall panels for protection during transportation and handling. Store and handle in strict compliance with manufacturer’s instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

B. Unload, store, and erect aluminum-faced composite wall panels in a manner to prevent bending, warping, twisting, and surface damage. Do not store panels horizontally. Always store vertically with top of panel down.

C. Store covered with suitable weather tight and ventilated covering. Store aluminum-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store aluminum-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Remove strippable protective covering on aluminum-faced composite wall panel just prior to panel installation.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal wall panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication, and indicate measurements on Shop Drawings.

1.11 COORDINATION

A. Coordinate aluminum-faced composite wall panel assemblies with rain drainage work, flashing, trim, aluminum curtainwall systems and construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-faced composite wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures, including rupturing, cracking, or puncturing.
    b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal-faced composite wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 (twenty) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required. Thickness per the requirements of the project as determined by manufacturer.

1. Surface: Smooth, flat finish.
2. Exposed Coil-Coated Finish:

a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Panel Sealants:

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray 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.
2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal wall panels and remain weathertight; and as recommended in writing by metal wall panel manufacturer. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.2 ATTACHMENT SYSTEM

A. Panel Mount and Reveal System: Provide continuous concealed system of extruded aluminum for mounting to structure. Retainer shall engage sections maintaining a uniform reveal width and unobstructed weep and secondary drainage path. System shall permit removal and replacement of installed panels. Provide 1/2” reveal width, unless otherwise shown on drawings.

B. Panel Edge Trim and Stiffeners: Provide continuous extruded aluminum combination trim and stiffener sections bonded and structurally fastened to rear face of composite panels with silicone. Provide sufficient stiffener extrusion to maintain flatness of the fabricated panel. Provide stiffener extrusions and rear face of composite panel with primer of other finish compatible with silicone. Edge trim and stiffener system shall mount to the assembly.

C. Fasteners: Provide corrosion-resistant self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Do not use exposed fasteners unless absolutely required by sequencing conditions. If required, provide exposed fasteners with heads matching color of metal-

faced composite wall panels by means of flush plastic caps or factory-applied coating and use EPDM, PVC, or neoprene sealing washers.

D. Concealed Flashing: Provide 0.040 inch aluminum of alloy and type required for compatibility with other components. Where exposed to view, match finish of composite aluminum panels.

2.3 AIR BARRIER/VAPOR RETARDER

A. See specification section 072726 “Fluid-Applied Membrane Air Barriers”.

2.4 THERMAL INSULATION

A. Rainscreen Cavity Wall Foam Plastic-Board Insulation: See specification section 072100 – Thermal Insulation.

2.5 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Subgirts: Manufacturer's standard C- or Z-shaped sections, 0.064-inch (1.63-mm) nominal thickness.

C. Zee Clips: 0.079-inch (2.01-mm) nominal thickness.

D. Base or Sill Angles or Channels: 0.079-inch (2.01-mm) nominal thickness.

E. Cold-Rolled Furring Channels: Minimum 1/2-inch- (13-mm-) wide flange.

1. Nominal Thickness: As required to meet performance requirements.
2. Depth: As indicated.

F. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.6 MISCELLANEOUS MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and finish indicated.

B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of aluminum-faced composite wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.7 ALUMINU-FACED COMPOSITE WALL PANELS

A. General: Provide factory-formed and -assembled, aluminum-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.

1. Fire-Retardant Core: Noncombustible, with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

B. Manufacturers and Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Dri-Design, Painted Aluminum Panels

2. Petersen Aluminum Pac-Clad Composite Wall Panel Pac-3000RS.
3. Alcoa Architectural Products Reynobond RB160PE
4. BAMCO Inc; System G500
5. Alcan Composites USA Inc.; Alucobond Plus.

C. Aluminum-Faced Composite Wall Panels: Provide factory-formed and -assembled, metal-faced composite wall panels fabricated from metal facings; formed into profile for Rain-Screen installation method. Include attachment system components and accessories where a weather tight-ness is required.

1. Wall Panels formed with 0.020-inch- (0.50-mm-) thick, coil-coated aluminum sheet facings.

a. Panel Thickness: 0.1575-inch (4 mm).
b. Core: Fire retardant.
c. Color: As indicated on the Drawings, or if not indicated as selected by Architect from manufacturer's full range. Custom if required.

D. Attachment System Components: Formed from material compatible with panel facing.

1. Include manufacturer's standard perimeter extrusions with integral weather stripping panel stiffeners panel clips and anchor channels.

2.8 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Provide pre-formed metal corners.

B. Flashing and Trim: Formed from 0.018-inch (0.46-mm) minimum thickness, aluminum sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, fasciae, parapet caps, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

1. Refer to Drawings for custom shapes and trim pieces to be fabricated from materials to match metal wall panels.

2.9 FABRICATION

A. General: Fabricate and finish aluminum-faced composite wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Factory form panels in a continuous process. Comply with indicated profiles and with dimensional and structural requirements. Fabricate panels in sizes shown using composite panel material and extruded perimeter and mounting system. Design and fabricate components to avoid compressive skin stresses in panels or deformation in installed assembly. Panel systems that use panel bow and return edge flex to accommodate contraction and expansion will not be permitted.

1. System Design: Rout and Return dry seal (gasketed).

B. Fabricate aluminum-faced composite wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Design, fabricate and assemble and erect system, with adjoining work, free of water leakage. Provide a means of concealed secondary drainage with baffles and weeps draining to the exterior at horizontal joints for water and condensation which may accumulate in the system. Apply sealants in joints only as indicated on drawings or as required by fabricator.

D. Aluminum-Faced Composite Wall Panels:

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
3. Corners: Provide formed corners with rout and return edges. Provide formed corners for soffit returns in the same manner. Open or mitered corners are not permitted.
4. Provide standard manufacturer vented slots in soffit panels as indicated on the drawings with insect proof screens.

5. Dimensional Tolerances:

   a. Panel Bow: 0.8 percent maximum of panel length or width.
   b. Squareness: 0.25 inch (5 mm) maximum.

E. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by aluminum-faced composite wall panel manufacturer.

   a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.10 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 and painted 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

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 metal wall panel 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 aluminum-faced composite wall panel manufacturer.

B. Examine roughing-in for components and systems penetrating aluminum-faced composite wall panels to verify actual locations of penetrations relative to seam locations of panels before panel installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorages according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

3.3 THERMAL INSULATION INSTALLATION

A. Rainscreen Cavity Wall Foam Plastic-Board Insulation: Extend insulation in thickness indicated to cover entire wall. Comply with installation requirements in Section 072100 “Thermal Insulation.”

B. Erect insulation horizontally and hold in place with metal furring members spaced 24 inches (610 mm) o.c. Attach furring members to substrate with screws spaced 24 inches (610 mm) o.c.

C. Retain insulation in place by metal clips and straps or integral pockets within panels, spaced at intervals according to insulation manufacturer's instructions. Maintain cavity width between insulation and metal wall panel of dimension indicated.

3.4 ALUMINUM -FACED COMPOSITE WALL PANEL INSTALLATION

A. General: Install aluminum-faced composite wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to channel framing unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Commence aluminum-faced composite wall panel installation and install minimum of 300 sq. ft. (27.8 sq. m) in presence of factory-authorized representative.
2. Shim or otherwise plumb substrates receiving aluminum-faced composite wall panels.

3. Flash and seal aluminum-faced composite wall panels at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
4. Install flashing and trim as aluminum-faced composite wall panel work proceeds.

    a. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
    b. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.

5. Fasteners:

    a. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

6. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by aluminum-faced composite wall panel manufacturer.
7. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of aluminum-faced composite wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.

    a. Prepare joints and apply sealants in accordance aluminum-faced composite wall panel manufacturer’s requirements.

8. Attachment System Installation, General: Install attachment system required to support aluminum-faced composite wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

    a. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
    b. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.

9. Clip Installation: Attach panel clips to supports at each aluminum-faced composite wall panel joint at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard fasteners.

    a. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to aluminum-faced composite wall panel manufacturer’s requirements.

10. Track-Support Installation: Provide manufacturer's standard horizontal and vertical tracks that provide support and complete secondary drainage system, draining to the exterior at horizontal joints. Install support system at locations, spacings, and with fasteners recommended by manufacturer. Attach panels to

wall by interlocking tracks with perimeter extrusions attached to wall panels. Fully engage integral gaskets and leave horizontal and vertical joints with open reveal.

a. Attach routed-and-returned flanges of wall panels to perimeter extrusions with manufacturer's standard fasteners.
b. Attach flush wall panels to perimeter extrusions by engaging panel edges and by attaching with manufacturer's standard structural silicone adhesive.
c. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
d. Do not apply sealants to joints unless otherwise indicated on Drawings.

11. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

a. Install components required for a complete aluminum-faced composite wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal plate wall panel units within installed tolerance of 1/4 inch in 20 feet, non-cumulative, on level, plumb, and location lines as indicated and with 1/8 inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by SEI/ASCE 7, but not less than 6.24 lbf/sq. ft. (300 Pa).

C. Water-Spray Test: After completing the installation of 75-foot- (23-m-) by-2-story minimum area of aluminum-faced composite wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.

D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust completed aluminum-faced composite wall panel installation, including accessories.

E. Aluminum-faced composite wall panels will be considered defective if they do not pass tests and inspections.

F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

G. Prepare test and inspection reports.

3.8 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal-faced composite wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal-faced composite wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.

B. After aluminum-faced composite wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074243

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SECTION 074293 - METAL SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes metal soffit panels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.

C. Samples: For each type of metal panel indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Warranties: Samples of special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

2.2 METAL SOFFIT PANELS

A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel

to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Ribbed-Profile Metal Soffit Panels: Perforated panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with flush joint between panels.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Architectural Building Components.
b. ATAS International, Inc.
c. CENTRIA Architectural Systems.
d. Dimensional Metals, Inc.
e. Firestone Metal Products, LLC.
f. Metal-Fab Manufacturing, LLC.
g. Metal Sales Manufacturing Corporation.
h. Petersen Aluminum Corporation.

2. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

a. Thickness: 0.040 inch (1.02 mm).
b. Surface: Smooth, flat finish.
c. Exterior Finish: Three-coat fluoropolymer.
d. Color: As selected by Architect from manufacturer's full range.

3. Panel Coverage: 12 inches (305 mm).
4. Panel Height: 1.0 inch (25 mm).

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.5 FINISHES

A. Panels and Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Wire tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.2 METAL PANEL INSTALLATION

A. Metal Soffit Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

B. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturers written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074293

SECTION 075323 - ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adhered EPDM membrane roofing system.

    a. Substrate Board
    b. Vapor Retarder
    c. Roof insulation.
    d. Cover Board
    e. Self-Adhering Membrane

2. Metal Fascia
3. Accessories: Flashing, sealants, etc.

B. All work noted within the summary shall be performed by a single contractor.

1.3 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.

D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals' markings.

1. Fire/Windstorm Classification: Class 1A-90.

1.5 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Roof plan showing orientation of steel roof deck and orientation of roofing and fastening spacing and patterns for mechanically fastened roofing.

a. Tapered insulation, including slopes.
b. Insulation thicknesses.

2. EPDM manufacturer's standard details including the following:

a. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
b. Base flashing and membrane terminations

3. Fascia details

D. Qualification Data: For qualified Installer and manufacturer as noted in "Quality Assurance" Article.

E. Manufacturer Certificate: Signed by roofing manufacturer certifying that membrane roofing system complies with requirements specified in "Performance Requirements" Article.

F. Sample No Dollar Limit (NDL) Warranty.

1.6 INFORMATION SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For membrane roofing system with submission of O&M manuals.

B. Warranties: Provide manufacturer warranties with requirements specified in "Warranties" article with submission of O&M manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed or FM Approvals approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product in order for the

system to receive manufacturer's no dollar limit (NDL) special warranty. Contractor shall be the same installer for both the roofing system and the vegetative roof system under specification section 073364, MODULAR VEGETATIVE ROOF SYSTEM.

C. Source Limitations: All components of the roofing system, including the SkyScape PreGrown Vegetated Roof System, but not limited to membranes, insulations, substrate boards, vapor barriers, fasteners, adhesives, etc. shall be from the same manufacturer as membrane roofing.

1.9 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.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty shall be a manufacturer’s no dollar limit (NDL) total system warranty. Partial roof system warranties are not permitted. The special warranty includes but is not limited to membrane roofing, flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, and other components of membrane roofing system. See separate specification section 073364 for additional requirements for including the MODULAR VEGETATIVE ROOF SYSTEM in the warranty.
2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EPDM MEMBRANE ROOFING

A. EPDM: ASTM D 4637, Type I, non-reinforced, uniform, flexible EPDM sheet.

B. Basis-of-Design Manufacturer and Product: Subject to compliance with requirements, an available manufacturer and product that may be incorporated into the Work include, but is not limited to following:

1. Manufacturer: Firestone Building Products:
2. Product: RubberGard EcoWhite EPDM Roofing System, Fully Adhered System.

    a. Thickness: 60 mils, nominal.
    b. Exposed Face Color: White.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil- thick EPDM, partially cured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard.

D. Seaming Material: Manufacturer's standard, synthetic-rubber polymer primer and 3-inch- (76 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. 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.

H. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch (25 mm) wide by 0.05 inch (1 mm) thick, prepunched.

I. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.

J. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Subject to compliance with requirements, an available manufacturer and product(s) that may be incorporated into the Work include, but is not limited to following which complies with basis-of-design manufacturer’s requirements:

    a. Full-spread spray-applied, low-rise, two-component urethane adhesive.

        1) Firestone ISO Stick

2) Firestone ISO Twin Pack

K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet 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.

L. Walkway Pad:

1. Subject to compliance with requirements, an available manufacturer and product(s) that may be incorporated into the Work include, but is not limited to following which complies with basis-of-design manufacturer's requirements:
   a. EPDM system compliant Walkway Pad adhered to the membrane at all ladder access points:
      1) Firestone Rubbergard Quickseam Walkway Pad.

M. Yellow Safety Strip:

1. Subject to compliance with requirements, an available manufacturer and product that may be incorporated into the Work include, but is not limited to following which complies with basis-of-design manufacturer's requirements:

   a. QuickSeam Yellow Safety Strip: Nominal 30 mil (0.76 mm) yellow unsupported TPO membrane laminated to a 35 mil (0.89 mm), white cured seaming tape. The QuickSeam Yellow Safety Strip is acceptable to be used on UltraPly™ TPO Membrane, RubberGard™ EPDM Membrane and RubberGard™ EcoWhite™ EPDM Membrane. The QuickSeam Yellow Safety Strip is used for designating a safety perimeter around the roof edge, equipment and any other rooftop hazards.

2.3 COVER BOARD

A. Cover Board: ASTM C1289 Type II, Class 4, Grade 2: a high density, closed-cell, polyisocyanurate foam and coated glass facers. Minimum R-value 2.5", and 120 PSI minimum compressive strength.

2.4 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured by EPDM membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

1. Provide the same insulation material where board insulation is noted as the substrate for EPDM membrane on vertical surfaces such as wall flashing within the drawings.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces. 20 PSI nominal.

C. Thickness: Minimum thickness of board insulation shall have a LTTR value of R-30 minimum at drains, sloped, two layers minimum, for the entire roof assembly.

D. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch (6 mm) per 12 inches (305 mm) unless otherwise indicated.

E. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

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. Roof Insulation and Cover Board adhesive: Membrane roofing system manufacturer's recommendations adhesive. Use application rates per roofing system manufacturer's recommendations for one of following adhesive applications as recommended:

1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
2. Full-spread spray-applied, low-rise, two-component urethane adhesive.

2.6 VAPOR RETARDER

A. Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm. Firestone V-Force Vapor Barrier Membrane is a vapor barrier comprised of SBS modified bitumen adhesive, factory-laminated to a tri-laminate woven, high-density polyethylene top surface. A polymeric release liner protects the adhesive. V-Force membrane is intended for use as a vapor retarder in Firestone roofing systems and may be used as a temporary roof membrane for up to ninety (90) days. Substrate board must be primed with V-Force Solvent Based Primer.

2.7 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/2 inch (13 mm) thick as recommended by roofing system manufacturer.

1. Application: Use substrate boards at structural roof deck areas such as metal deck.

2.8 SHEET METAL FLASHING AND TRIM

A. General Requirements:

1. All sheet metal flashing and trim to be provided and installed by the EPDM roofing system installer.
2. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
3. 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.
4. Obtain field measurements for accurate fit before shop fabrication.

5. Underlayment Material at Non-EPDM Roof Coverings: Synthetic underlayment consisting of laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F (111 deg C); and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.
6. 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.
7. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
8. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (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.
9. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
10. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
11. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
12. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
13. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
14. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
15. Sealants: Single component clear silicone
16. Miscellaneous: Provide all necessary miscellaneous materials required for complete watertight installation as recommended by the roofing system manufacturer.

B. Caps, Coping, Curbs, and Flashings

1. Parapet Cap and Expansion-Joint Cover: Shop fabricate interior and exterior corners. Fabricate from galvanized steel: 0.034 inch thick minimum.
2. Copings: Fabricate in minimum 96-inch- long, but not exceeding 12-foot- long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners. Fabricate from galvanized steel: 0.040 inch thick minimum.
3. Roof Curbs: Shop fabricated and welded top box and integral full-length cricket. Fabricate curb subframing of minimum 0.0598-inch- thick, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads, of size and height indicated. Fabricate from galvanized steel: 0.028 inch thick minimum.
4. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from galvanized steel: 0.028 inch thick minimum.

5. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from galvanized steel: 0.022 inch thick minimum.
6. Flashing Receivers: Fabricate from galvanized steel: 0.022 inch thick minimum.
7. Roof-Penetration Flashing: Fabricate from galvanized steel: 0.028 inch thick minimum

C. Color: All exposed surfaces of flashing and trim shall be prefinished sheet metal. Architect to select color from manufacture's full range of standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."
4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
6. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.

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 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.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

1. Fasten substrate board to top flanges of steel deck according to recommendations in FM Global's "RoofNav" and FM Global Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.
2. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.5 VAPOR-RETARDER INSTALLATION

A. Self-Adhered Membrane: V-Force membrane can be applied at ambient temperatures as low as 25 °F (-4 °C) as long as it has been stored in a heated area so that it will be between 50 °F (10 °C) and 100 °F (38 °C) at the time of application. All substrates except metal decks must be primed with Firestone SA Solvent Based Primer (W563587090). V-Force membrane must be installed with minimum 3" (76.2 mm) side laps and 6" (152.4 mm) end laps. V-Force membrane should be rolled in with a 75 lb (34 kg) roller to fully mate each roll to substrate, including all lap areas.

3.6 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (69 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (152 mm) in each direction.

D. Install tapered insulation under area of roofing to conform to slopes indicated.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6mm) of nailers, projections, and penetrations.

G. Adhered Insulation - Cold Adhesive Application: Install each layer of insulation and adhere to substrate with one of the following options per the membrane manufacturer’s 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.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck

1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.

3.7 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.

B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeters.

E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

F. Adhesive Seam Installation: Clean both faces of splice areas, apply splicing cement, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.

1. Apply a continuous bead of in-seam sealant before closing splice if required by membrane roofing system manufacturer.

G. Tape Seam Installation: Clean and prime both faces of splice areas, apply splice tape, and firmly roll side and end laps of overlapping membrane roofing according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of membrane roofing terminations.

H. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

I. Spread sealant or mastic bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.8 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply 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.

3.9 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Contracting Officer’s Representative.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates and repair or reinstall membrane 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 075323

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SECTION 076200 - SHEET METAL FLASHING AND TRIM AND (MP-2 WALL PANELS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Sheet metal flashings and trim work.

B. Formed wall sheet metal fabrications (MP-2 Wall Panels).

C. Formed low-slope roof sheet metal fabrications.

D. Canopy enclosure sheet metal.

1.3 QUALITY ASSURANCE

A. Sheet metal fabricator and installer shall have minimum five (5) years experience of shop fabrication and installation of shop fabricated roofing metals and flashings.

B. Reference Standards

1. ASTM A525 Spec. for Steel Sheet, Zinc Coated (Galvanized) by the Hot Dip Process, Commercial Quality
2. ASTM B209 Spec. for Aluminum and Aluminum Alloy Sheet and Plate
3. ASTM C920 Spec. for Elastomeric Joint Sealants
4. ASTM D746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
5. SMACNA Sheet Metal and Air Conditioning Contractor's National Association Architectural Sheet Metal Manual.

1.4 SUBMITTALS

A. Refer to Division 1 for General Submittal Requirements.

B. Product Data: Manufacturer's descriptive literature with technical data indicating materials, tests and installation and storage instructions.

D. Shop Drawings: Plan layout with dimensions, details indicating profiles, fastening and connection methods and joints. Indicate all components, materials, and finishes.

E. Samples

1. Two (2) samples for color and profile approval, printed color samples not allowed. Material samples shall be 4" wide x 12" long.

F. Warranty

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery, storage, and handling shall be accomplished in such a manner as required to prevent damage to components and their finishes.

B. Materials shall be carefully handled to prevent damage to the surfaces, edges, ends, and shall be stored at the site above the ground in a covered and dry location. Damaged items that cannot be restored to original condition will be rejected.

C. Factory fabricated items shall be delivered in manufacturer's original unopened containers with brand names and material designation clearly marked thereon.

1.6 WARRANTY

A. Contractor shall guarantee materials and workmanship to be watertight for two (2) years, along with roofing system.

B. Manufacturer's twenty (20) year guarantee for colorfastness and finish of standard color prefinished materials and five (5) year guarantee for special custom colors.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Shop fabricated flashings (other than prefabricated parapet copings):

1. Peterson Aluminum Company "Pac-Clad" .040 anodized aluminum stock, thickness as required for application.

a. Matching watertight fasteners where exposed.
b. Color: As selected from manufacturer’s full range. Custom color as required.

C. Prefabricated Coping System

1. Metal Era Company "Perma-Tite" anodized aluminum coping system. Full snap-on design tapered style.

a. One piece galvanized metal wall cap with anchor clips both sides.
b. Concealed splice plate: Galvanized steel with factory applied sealant.
c. Cover: .050" aluminum.
d. Color: As selected from manufacturer’s full range. Custom color as required.
e. Custom fabricate to dimensions and profile indicated on drawings.

D. Shop Fabricated Counter Flashings and Reglets

1. Shop fabricate counter flashings to sizes and profile shown on the drawings.

a. Concealed: Aluminum .032" thick, mill finish.
b. Exposed to view: Anodized Aluminum .032" thick. Color to match coping and/or gravel stop.
c. Fabricate all flashings to lock into reglets and have spring pressure onto membrane flashings. Fabricate exposed counterflashings with concealed joint covers.
d. Fabricate reglets to accept counterflashings.

E. Shop Fabricated Counter Flashings

1. Shop fabricate counter flashings to sizes and profile shown on the drawings.

a. Concealed: Aluminum mill finish.
b. Exposed to view: Finish to match gravel stop and coping system.

H. Miscellaneous

1. Fasteners shall be as recommended by manufacturer for type and size for each application except as specified herein.

a. Stainless steel fasteners at aluminum - concealed.
b. Custom color finish to match aluminum finish at exposed fasteners.
c. Expansion anchors shall be drill in type, Tapcon, Phillips, or Rawl.

2. Sealants: Clear silicone GE, Dow, or approved equal.
3. Miscellaneous: Provide all necessary miscellaneous materials required for complete watertight installation as recommended by the manufacturer.

2.2 MP-2 WALL PANELS

A. General: Custom fabricate metal wall panels with shop-applied sheet metal flashing over ¾" exterior grade plywood. Fabricate according to the general requirements in paragraph 2.3 below. Panels shall have clips applied to attach to 3" metal z-furring at 24" O.C.

2.3 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. 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. 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: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (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.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
   2. Use lapped expansion joints only where indicated on Drawings.

E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. 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.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

K. Do not use graphite pencils to mark metal surfaces.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General Requirements

   1. Entire roofing and flashing systems shall be sealed against moisture penetration.
   2. Shop fabricate counter flashings only from approved shop drawings in conformance with the bidding documents.

B. Workmanship: Design and anchor so work will not be objectionable, distorted, nor flashings seriously stressed from expansion and contraction of metal.

C. Miscellaneous Roofing Flashings

1. Comply with drawings and roofing manufacturer's requirements for metal flashing and counter flashings.
2. Lap counter flashings minimum of 1" and provide clear sealant at all laps.

D. Gravel Stop/Fascia and Coping Systems

1. In accordance with manufacturer's printed instructions and approved shop drawings.

    a. Accurate and straight in line with deviation of plane or edges of fascia.
    b. Allow for expansion and contraction of coping cover.
    c. Seal all joints beneath face metals to concealed joint covers except expansion joints.

2. Fasten galvanized metal wall cover into wood blocking thru membrane flashing with galvanized roofing nails.

3.2 ADJUST AND CLEAN

A. Touch up paint all abraded exposed surfaces of prefinished metal.

B. Clean premises of all litter, dirt and debris created by work of this Section.

END OF SECTION 076200

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SECTION 077233 - ROOF HATCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Roof Hatch
2. Safety Railing System
3. Ladder-Assist Post

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical data for roof hatch assembly, safety railing system, ladder-assist post, latching or locking provisions, and other pertinent data.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Operation and maintenance manuals with submission of O&M manuals.

B. Warranties: Provide manufacturer warranties with requirements specified in "Warranties" article with submission of O&M manuals.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Provide hatch safety railing system as required by OSHA Standard 1910.23 and 1910.27 and as specified in this section.

1.6 WARRANTY

A. Provide manufacturer's written 5-year warranty

1. Warrant materials and workmanship against defects.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site ready use.

B. Exercise proper care in handling of Work so as not to damage finished surfaces. Protect Work from damage after it is in place.

C. Store materials under cover in a dry and clean location off the ground. Replace materials that are damaged or otherwise not suitable for use.

PART 2 - PRODUCTS

2.1 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units that are 48” (12199mm) in width x 48” (1219 mm) in length with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant, and integrally formed deck-mounting flange at perimeter bottom.

1. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to following:

    a. Babcock-Davis; Model - BRHPG
    b. Bilco: Type F
    c. J.L. Industries: RHG-5

B. Hatch Construction: Personnel Series Galvanized Steel Roof Hatches

1. Cover and Liner: 14 gauge galvanized steel cover with 1 inch rigid fiberboard insulation and 22 gauge galvanized steel cover liner.
2. Curb: 14-gauge galvanized steel with 3/4 inch rigid fiberboard insulation at curb perimeter.
3. Hinges: Zinc plated steel tamperproof hinge contained within hatch as part of spring assembly.
4. Latch: Zinc plated steel slam latch with turn handle and inside/outside padlock hasps.
5. Springs: Greased heavy-duty compression springs in telescoping tubes.
6. Hardware: Zinc plated steel hold open arm(s) with red vinyl grip handle that automatically locks the door when opened. Furnish hatches with interior padlock hasp and EPDM draft seal.
7. Mounting Flanges:

    a. Double Wall Curb with 3.5” horizontal mounting flange
    b. Curb Mount with 3” vertical mounting flange

2.2 FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Steel: Manufacturer's standard factory-applied powder coat primer.

1. Finish paint in the field after installation is complete by general contractor.

    a. Color: Gray

2.3 SAFETY RAILINGS

A. Model: SRCG

B. Top rail, Mid rail and upright posts: Galvanized Steel Pipe, 1-1/4” ID, A53 Grade B pipe.

C. Exit: Self Closing Gate; Galvanized Steel Pipe, 1-1/4” ID A53 Grade B pipe, U bolt with hinge attachment and galvanized mounting bolts and nut hardware.

1. Option: Chain, link, galvanized steel

D. Fittings: Manufacturer's standard aluminum magnesium alloy, cast with set screw pipe mount

E. Counterflash Mount: CRS, zinc plated mounting bracket with backer plate, pemmed nut for easy installation.

F. Hardware: Bolts and Tooling: 3/8 inch by 2-1/2 inch, grade Z, zinc plated, wrench for assembly

G. OSHA Compliance: Provide hatch safety railing system as required by OSHA Standard 1910.23 and 1910.27 and as specified.

1. Top Rail Height: 42 inches +/-3" above finished roof deck.
2. Top-Mid Rail Spacing: 21" diameter maximum.
3. Meets 200lb deflection load when mounted to roof hatch counterflash.
4. Upright post maximum spacing of 8'.

2.4 SAFETY POST (LADDER-ASSIST POST)

A. Model: SPM1: Steel, Red Powder Coat Finish

B. Post: Manufactured of high strength square tubing, 1-1/2" x 1-1/2" x 1/8". A pull up loop shall be provided at the upper end of the post to facilitate raising the post

C. Ladder Mounting: Attaches directly to the top two rungs (square or round) of fixed ladder

D. Balancing spring: A stainless steel constant force balancing spring mechanism shall provide smooth, easy, controlled operation when raising and lowering the safety post

E. Hardware: Mounting hardware shall be zinc plated steel, providing superior strength

F. Tubular post shall lock automatically when fully extended. Release lever shall disengage the post to allow it to be returned to its lowered position

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion.

B. Verify that deck, curbs, roof membrane, base flashing, and other items affecting Work of this Section are in place and positioned correctly.

C. Verify tolerances and correct improper conditions.

D. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install roof accessory items and components per manufacturer's instructions.

B. Coordinate installation of components of this Section with installation of roof deck, roof structure, roofing membrane, and base flashing.

C. Coordinate installation of sealant and roofing cement with Work of this Section to ensure water tightness.

D. Coordinate installation of flashing flanges into reglets, if applicable.

E. Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.

F. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

3.3 ADJUSTING

A. Adjust movable parts for smooth operation.

B. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.4 CLEANING

A. Clean exposed surfaces per manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION 077233

SECTION 077237 – ROOFTOP GUARDRAIL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Prefinished freestanding rooftop safety guardrail system for roof edge conditions including:

a. Pipe railings
b. Posts
c. Bases
d. Fittings and connections

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Drawings showing plans, elevations, sections and details of components.

1.4 CLOSEOUT SUBMITTALS

A. Warranties: Provide manufacturer warranties with requirements specified in “Warranties” article with submission of O&M manuals.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Occupational Safety & Health Administration (OSHA): 29 CFR 1910.23 - Guarding Floor and Wall Openings and Holes.

1.6 WARRANTY

A. Provide manufacturer’s written two (2)-year warranty

1. Warrant materials and workmanship against defects.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in good condition and adequately protected against damage as handrails are a finished product.

B. Inspect rail sections for damage before signing the receipt from the trucking company. Truck driver must note damaged goods on the bill of lading if damaged product is found.

C. Store products in manufacturer's unopened packaging until ready for installation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of Design Manufacturer and Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Manufacturer: BlueWater Mfg., Inc.; Chaska MN
2. Product: SafeyRail 2000

2.2 GUARDRAIL SYSTEM

A. General: Provide freestanding pedestrian egress barrier system on roof, including pipe, railings, uprights, bases, and fittings.

B. Basis-of-Design Assembly:

1. Standards: System shall have top and mid rail in accordance with OSHA Standards - 29 CFR 1910.23 (a)(2).
2. Structural Load: 200 lb (90.7 kg), minimum, in any direction to all components in accordance with OSHA Regulation 29 CFR 1926.502.
3. Height: 42 inches (1067 mm), minimum.
4. Railings: 1-5/8 inch (41 mm) O.D. hot rolled pickled electric weld tubing, free of sharp edges and snag points.
5. Mounting Bases: Class 30 gray iron material cast with four receiver posts. Provide rubber pads on bottom of bases.
6. Receiver Posts: Shall have a positive locking system into slots that allow rails to be mounted in any direction. Friction locking systems are not allowed. Receiver posts shall have drain holes.
7. Hardware: Securing pins shall be 1010 carbon steel, zinc plated and yellow chromate dipped. Pins shall consist of collared pin and lanyard that connects to lynch pin.

2.3 FITTINGS

A. Pipe Fittings:

1. Provide manufacturer's standard pipe fittings required for a complete operational system that meets OSHA requirements.
2. Material, Structural Pipe Fittings: Malleable iron, in accordance with BS EN 1562.
3. Material, Fitting Types 26, 27 and 90: Weldable cast steel, in accordance with BS 3100.
4. Finish: Pipe fittings shall be galvanized in accordance with BS EN ISO 1461.
5. Fitting, Inside Diameter:

    a. Manufacturer's standard.

6. Hardware: Stainless steel set screws, in accordance with BS 970 Grade 420. Each set screw shall support axial load of 900 kg when tightened to torque of 40Nm.

2.4 FINISHES

A. Finish: Factory finished powder coat paint.

B. Color: Safety yellow.

2.5 FABRICATION

A. Assemble components with joints tightly fitted and secured. Accurately form components to suit installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 077237

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SECTION 078413 – PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.

B. Related Sections:

1. DIVISION 07 Section "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated constructions.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. E84 - Test Method for Surface Burning Characteristics of Building Materials.
2. E814 - Test Method for Fire Tests of Through-Penetration Fire Stops.

B. Underwriters Laboratories Inc. (UL):

1. Qualified Firestop Contractor Program Requirements.
2. 1479 - Fire Tests of Through-Penetration Firestops (ANSI).
3. Fire Resistance Directory.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. .

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire- resistance-rated assembly.

C. Qualification Data: For qualified Installer.

D. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

    a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
    b. Classification markings on penetration firestopping correspond to designations listed by the following:

        1) UL in its "Fire Resistance Directory."

C. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project Site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Owner's inspecting agency and building inspector, if required by authorities having jurisdiction.

D. Notify testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Manufacturers' names are given to clarify the designer's intent and are not intended to limit selection of similar manufacturer's with similar products.

1. Grace Construction Products.
2. 3M Fire Protection Products.
3. Tremco, Inc.; Tremco Fire Protection Systems Group.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire- resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Fire-resistance-rated walls include fire walls, fire-barrier walls, and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.

D. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those

components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

    a. Slag-wool-fiber or rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING:

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building
2. Management of Any Damage."
3. Contractor's name, address, and phone number.
4. Designation of applicable testing and inspecting agency.
5. Date of installation.
6. Manufacturer's name.
7. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Installer will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Firestopping with No Penetrating Items FS-1:

1. UL-Classified Systems: C-AJL-0001-0999.
2. W-Rating: No leakage of water at completion of water leakage testing.
3. Type of Fill Materials: As required to achieve rating.

C. Firestopping for Metallic Pipes, Conduit, or Tubing FS-2:

1. UL-Classified Systems: C-AJL-1001-1999.
2. W-Rating: No leakage of water at completion of water leakage testing.
3. Type of Fill Materials: As required to achieve rating.

D. Firestopping for Nonmetallic Pipe, Conduit, or Tubing FS-3:

1. UL-Classified Systems: C-AJL-2001-2999.
2. W-Rating: No leakage of water at completion of water leakage testing.
3. Type of Fill Materials: As required to achieve rating.

E. Firestopping for Electrical Cables FS-4:

1. UL-Classified Systems: C-AJL-3001-3999.
2. W-Rating: No leakage of water at completion of water leakage testing.
3. Type of Fill Materials: As required to achieve rating.

F. Firestopping for Cable Trays with Electric Cables FS-5:

1. UL-Classified Systems: W-AJL-4001-4999.
2. W-Rating: No leakage of water at completion of water leakage testing.
3. Type of Fill Materials: As required to achieve rating.

G. Firestopping for Insulated Pipes FS-6:

1. UL-Classified Systems: C-AJL-5001-5999.
2. W-Rating: No leakage of water at completion of water leakage testing.
3. Type of Fill Materials: As required to achieve rating.

H. Firestopping for Miscellaneous Electrical Penetrants FS-7:

1. UL-Classified Systems: C-AJL-6001-6999.
2. W-Rating: No leakage of water at completion of water leakage testing.
3. Type of Fill Materials: As required to achieve rating.

I. Firestopping for Miscellaneous Mechanical Penetrants FS-8:

1. UL-Classified Systems: C-AJL-7001-7999.
2. W-Rating: No leakage of water at completion of water leakage testing.
3. Type of Fill Materials: As required to achieve rating.

J. Firestopping for Groupings of Penetrants FS-9:

1. UL-Classified Systems: C-AJL-8001-8999.
2. W-Rating: No leakage of water at completion of water leakage testing.
3. Type of Fill Materials: As required to achieve rating.

END OF SECTION 078413

SECTION 078446 – FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. Section Includes:

1. Joints in or between fire-resistance-rated constructions.

B. Related Sections:

1. DIVISION 07 SECTION “Penetration Firestopping" for penetrations in fire-resistance- rated walls.

1.3 REFERENCES:

A. ASTM International (ASTM):

1. E84 - Test Method for Surface Burning Characteristics of Building Materials.
2. E119 - Method for Fire Tests of Building Construction and Materials.
3. E1966 - Test Method for Fire-Resistive Joint Systems.

B. FM Global (FM):

1. 4991 - Approval of Firestop Contractors.

C. Underwriters Laboratories Inc. (UL):

1. 2079 - Tests for Fire Resistance of Building Joint Systems (ANSI).
2. Fire Resistance Directory.

D. Edison Testing Laboratory (ETL SEMKO):

1. Directory of Listed Building Products.

1.4 SUBMITTALS:

A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's

fire- protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

C. Qualification Data: For qualified Installer.

D. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:

    a. Fire-resistive joint system products bear classification marking of qualified testing agency.
    b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:

        1) UL in its "Fire Resistance Directory."

D. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS:

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.7 COORDINATION:

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS:

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
3. Manufacturers: Manufacturers' names are given to clarify the designer's intent and are not intended to limit selection of similar manufacturer's with similar products.

    a. Nelson Firestop Products.
    b. 3M Fire Protection Products.
    c. Tremco, Inc.; Tremco Fire Protection Systems Group.

C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete masonry units.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION:

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire- resistive joint system.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire- resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION:

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL:

A. Inspecting Agency: Installer will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING:

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire- resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE:

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

B. Wall-to-Wall, Fire-Resistive Joint Systems FRJS-2:

1. UL-Classified Systems: WW-D 1000-1999.

C. Head-of-Wall, Fire-Resistive Joint Systems FRJS-4:

1. UL-Classified Systems: HW-D 1000-1999.

D. Bottom-of-Wall, Fire-Resistive Joint Systems FRJS-5:

1. UL-Classified Systems: BW-D 1000-1999.

E. Wall-to-Wall, Fire-Resistive Joint Systems Intended for Use as Corner Guards FRJS-6:

1. UL-Classified Systems: CG-D 1000-1999.

F. Perimeter Fire-Resistive Joint Systems PFRJS-7:

1. UL-Classified Perimeter Fire-Containment Systems: CW-D 1000-1999.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT 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 (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which 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. Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

C. Warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural 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 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified. Manufacturers' names and products are given to clarify the designer's intent and are not intended to limit selection of similar products from acceptable manufacturers.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.3 SILICONE JOINT SEALANTS

A. (JS-1) Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dow Corning Corporation; 799.
    b. Polymeric Systems, Inc.; PSI-631.
    c. Pecora Corporation; 898
    d. Tremco Incorporated; Tremsil 600.

2.4 URETHANE JOINT SEALANTS

A. (JS-2) Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT, M, A, and O.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Pecora Corporation; Dynatrol II.
    b. Polymeric Systems, Inc.; PSI-270.
    c. Tremco Incorporated; Dymeric 240.

B. (JS-3) Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT, T, M, A, and O.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. BASF Building Systems; Sonolastic NP 2.
    b. Pecora Corporation; Dynatred.
    c. Tremco Incorporated; Vulkem 227.

2.5 LATEX JOINT SEALANTS

A. (JS-4) Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, mildew-resistant, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. BASF Building Systems; Sonolac.
b. Bostik, Inc.; Chem-Calk 600.
c. Pecora Corporation; AC-20+.
d. Schnee-Morehead, Inc.; SM 8200.
e. Tremco Incorporated; Tremflex 834.

2.6 ACOUSTICAL JOINT SEALANTS

A. (JS-5) Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pecora Corporation; AC-20 FTR.
b. USG Corporation; SHEETROCK Acoustical Sealant.

2.7 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material, not for horizontal applications) Type B (bicellular material with a surface skin, not for horizontal applications) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 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 joint-sealant performance.

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 C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install 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.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

F. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

   a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate.

   b. 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.

2. 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 passes sealant manufacturer's field-adhesion hand-pull test criteria.

3. 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 fill, sealant configuration, and sealant dimensions.
4. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior and interior joints in horizontal traffic surfaces. (JS-3)

1. Joint Locations:

    a. Isolation and contraction joints in cast-in-place concrete slabs.
    b. Control joints between concrete slabs and foundation walls, or other slab penetrations.
    c. Joints between different materials listed above.
    d. Other joints as indicated.

2. Urethane Joint Sealant: Multicomponent, nonsag, traffic grade, Class 25.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces. (JS-2)

1. Joint Locations:

    a. Construction joints in cast-in-place concrete, non-traffic conditions.
    b. Control and expansion joints in unit masonry.
    c. Joints between metal panels, where indicated.
    d. Joints at perimeter of aluminum storefront and window assemblies
    e. Sealed joints associated with terra cotta rainscreen systems.
    f. Joints between different materials listed above and at exterior wall penetrations through the above materials and assemblies.
    g. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
    h. Control and expansion joints in soffits and other overhead surfaces.
    i. Other joints as indicated.

2. Urethane Joint Sealant: Multicomponent, nonsag,, Class 50.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces (JS-1).

1. Joint Locations:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.
    c. Tile control and expansion joints.
    d. Vertical joints on exposed surfaces of interior unit masonry walls and partitions.
    e. Perimeter joints between interior wall surfaces and frames of interior doors windows, and mechanical/electrical components.
    f. Other joints as indicated.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 50**.**
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces (JS-4).

1. Joint Sealant Location:

   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Other joints as indicated.

2. Joint Sealant: Acrylic latex or siliconized acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces (JS-5).

1. Joint Location:

   a. Acoustical joints where indicated.
   b. Other joints as indicated.

2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

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SECTION 079500 – EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall expansion control joints

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: Submit manufacturer's descriptive and technical data and illustrations, clearly marked to show specific products, materials, and compliance with requirements. Clearly indicate movement capability of cover assemblies and suitability of material used in exterior seals for ultraviolet light exposure. Include manufacturer’s printed installation instructions.

C. Shop Drawings: Submit large-scale Shop Drawings showing full extent of expansion control including layouts, changes in direction, intersections, and terminations.

D. Samples: Submit samples showing colors for the Architect's selection.

E. Certification: Submit manufacturer’s written certification that products supplied for installation comply with regulatory requirements and meet specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Furnish manufacturer’s printed recommendations for the care and maintenance of expansion joint cover assemblies to the Owner with submission of O&M manuals.

1.5 QUALITY ASSURANCE

A. Qualifications, Installer: Installer shall be experienced in the installation of expansion control devices of the types required.

B. Regulatory Requirements:

1. Expansion control devices and their installation shall be in compliance with requirements of the applicable building code and other regulations.
2. Fire-Rated Assemblies:

a. Fire-rated expansion joint cover assemblies shall be identical to those of assemblies whose cycling capability has been determined in accordance with ASTM E1399 "Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems" and fire resistance in accordance with ANSI/UL 2079 "Tests for Fire Resistance of Building Joint Systems" or ASTM E1966 "Standard Test Method for Fire-Resistive Joint Systems", as acceptable to the authority having jurisdiction.
b. Provide fire-rated expansion joint cover assemblies with fire ratings not less than that of adjacent construction, and as specified.
c. Fire barriers shall be tested in maximum joint width condition with a field splice as a component of expansion control device including hose stream testing of vertical wall assemblies at full-rated period by UL.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials in manufacturer's original, unopened protective packaging, clearly identified with manufacturer's name and type of product.

B. Store materials under cover in a dry, clean, and protected location.

C. Comply with additional requirements of the manufacturer.

1.7 JOB CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and show measurements on final Shop Drawings.

B. Coordination:

1. Coordinate expansion joint cover assemblies with the Work of other trades.
2. Furnish anchorages, setting drawings, templates, and instructions for installation of expansion joint cover assemblies to be embedded in concrete or have recesses formed into edges of concrete slab for later placement and grouting-in of frames.
3. Coordinate installation of fire-rated expansion control device materials with related Work so complete assemblies comply with assembly performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

1. Basis-of-Design Manufacturer: Emseal Joint Systems, Ltd.
2. Basis-of-Design Typical Product: Emshield Security Seal SSW2
3. Basis-of-Design Typical Interior Exposed Floor Transition: Emseal FN 50/20.

2.2 EXPANSION CONTROL DEVICES

A. Security Seal: UL 2-hour fire-rated seal comprised of fire-retardant-impregnated foam that is factory pre-coated on both facing sides with an intumescent fire-proofing material. Seal shall be pre-compressed and self-expanding, have plus 25 percent and minus 25 percent (50 percent total) movement capability, and have a hardened pick-, vandal-, and tamper-resistant waterproof polyurethane surface:

1. Depth: 4-inches.

B. Associated Materials: In compliance with UL listing requirements and as follows.

1. Adhesive: Epoxy-type with primer, as recommended in writing by the manufacturer to suit job conditions.
2. Polyurethane Sealant: Manufacturer's standard field-injected polyurethane sealant.
3. Intumescent Sealant: Manufacturer's standard field-injected intumescent sealant.

2.3 FABRICATION

A. Fabricate expansion control devices in accordance with the final accepted Shop Drawings and as specified.

B. Fabricate assemblies for joint sizes indicated, in lengths to minimize field splicing, and with the capability to accommodate variations in adjacent surfaces.

C. Make directional changes and terminations into horizontal plane surfaces by factory-manufactured universal 90-degree single units containing minimum 12-inch long leg and 6- inch long leg or custom leg on each side of the direction change or through field fabrication in accordance with the manufacturer's printed installation instructions.

PART 3 - EXECUTION

3.1 INSPECTION

A. Verify that conditions are satisfactory for the installation of expansion control devices.

B. Ensure that expansion openings have been constructed to required dimensions. Ensure that there is sufficient depth to receive the full depth of the size of the expansion control devices being installed.

C. Do not begin installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection:

1. Protect adjacent surfaces and finishes from damage during installation of this expansion control.
2. Protect products from damage during field handling and installation.

3.3 Surface Preparation:

A. Prepare surfaces to receive expansion in compliance with the manufacturer's printed instructions and recommendations.

1. Repair surfaces as required to ensure they are smooth, even, and sound.
2. Clean surfaces adjacent to and including expansion openings prior to installation.
3. Ensure that surfaces are free of debris, oil, dirt, dust, and other foreign and deleterious materials.

3.4 INSTALLATION

A. General Requirements:

1. Install expansion control incompliance with the manufacturer's printed instructions, accepted Shop Drawings, as indicated, and as specified. Notify Architect in writing where discrepancies occur that will affect proper joint installation and performance.
2. Install factory-preformed units in true alignment and proper relationship to expansion joints and adjoining finished surfaces, measured from established lines and levels.
3. Install units in continuous contact with adjacent surfaces.
4. Maintain continuity of assemblies. Hold end joints to a minimum.
5. Seal transitions and butt joints watertight using manufacturer's recommended procedures.
6. No drilling, or screwing, or fasteners of any type are permitted to anchor the sealant system into the substrate.

B. Fire-Rated Assemblies:

1. In addition to general requirements, install fire-rated assemblies in compliance with their UL listing requirements to provide continuous, uninterrupted fire resistance throughout length of joint.
2. Prime joint surfaces and adhesively install pre-compressed wall seals.
3. Apply continuous field-injected sealant bands to seal wall seals at weather-facing surfaces.
4. Seal joints between wall seals bellows edges with polyurethane sealant and with intumescent sealant on foam faces.

3.5 COMPLETION

A. When complete, each expansion joint over assembly shall be set square, plumb, and level; accurately aligned to position intended; and securely anchored to supporting Work.

B. Components shall be flexible as applicable and waterproof as required.

C. Exposed surfaces shall be clean and free from scratches, dents, tool marks, stains, discoloration, or other defects or damage.

3.6 PROTECTION

A. Protect expansion joint cover assemblies from damage and deterioration, other than normal weathering, until time of completion and acceptance by the Owner.

END OF SECTION 079500

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Fiberglass Reinforced Polyester (FRP) Doors”.
4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
5. Division 08 Section "Door Hardware".
6. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
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 anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages 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.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CECO Door Products.
2. Curries Company.
3. Security Metal Products.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

2. Core Construction: Manufacturer's standard polystyrene. Where indicated, provide doors fabricated as thermal-rated assemblies with a minimum R-value of 2.8 or better.
3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company Polystyrene Core: 707 Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Manufacturers Basis of Design:

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

    a. Curries Company CM Series.
    b. Curries Company M Series.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and

approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight 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 butt welding.

4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
7. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
8. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

9. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
10. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.

3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

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.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel 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.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Solid-core doors with wood-veer faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.

1.2 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Doors to be factory finished and finish requirements.

D. Samples for Initial Selection: For factory-finished doors.

E. Samples for Verification: (Provide submittal after all other Action

1. Provide Samples for Verification after all other Action Submittals have been approved.
2. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish.
3. 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.

F. Sample Warranty: For special warranty.

1.3 CLOSEOUT SUBMITTALS

A. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality Certification Program.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during 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. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
b. 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 shall also include 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. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

1. Algoma Hardwood Doors, Inc.
2. Marshfield Door Systems
3. Mohawk Flush Doors, Inc.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards.

B. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.

C. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

D. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

E. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C required by Authority Having Jurisdiction (AHJ).

1. Label Certification: Doors requiring fire-rating will carry either UL or ITS (Warnock Hersey) label. Manufacturer's certification labels may be used for door size variations if approved by AHJ (Authority Having Jurisdiction).
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 250 degrees F (121 degrees C)] above ambient after 30 minutes of standard fire-test exposure.
3. Cores: Provide wood fiber or mineral fire-resistant composite core as needed to provide fire-protection rating indicated.
4. Blocking: Provide composite blocking approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.

F. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

G. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf (3100 N).
b. Screw Withdrawal, Edge: 400 lbf (1780 N).

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: Select white maple.
3. Cut: Plain sliced (flat sliced).
4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Exposed Vertical and Top Edges: Same species as faces.
8. Core: Structural composite lumber.
9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.
10. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Manufacturer's standard shape.

2.5 FABRICATION

A. A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with NFPA 80 requirements for fire-rated doors.

B. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

2.6 SHOP PRIMING

A. Doors for Transparent Finish: Shop prime faces and all four edges with stain (if required), other required pretreatments, and first coat of finish as selected by Architect from manufacturer’s samples. Seal edges of cutouts and mortises with first coat of finish.

2.7 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all six edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. Grade: Custom.
2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 9, UV curable epoxy.
3. Staining: As selected by Architect from manufacturer's full range.
4. Sheen: Satin.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

B. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

1. Comply with NFPA 80 for fire-rated doors.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.
b. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 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 081416

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SECTION 081613 – FIBERGLASS REINFORCED POLYESTER (FRP) DOORS AND ALUMINUM FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Fiberglass reinforced polyester doors.
2. Aluminum frames for fiberglass reinforced polyester doors.

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in doors.
2. Division 08 Section “Hollow Metal Doors and Frames” for hollow metal frames.
3. Division 08 Sections "Door Hardware" and "Access Control Hardware" for door hardware.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
2. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
4. ASTM D 256 - Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.
5. ASTM D 543 - Evaluating the Resistance of Plastics to Chemical Reagents.
6. ASTM D 1308 - Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
7. ASTM D 2126 - Response of Rigid Cellular Plastics to Thermal and Humid Aging.
8. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products.
9. ASTM E 84 - Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, components, hardware reinforcements, profiles, and finishes.

B. Templates: Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors.
3. Locations of reinforcement and preparations for hardware.
4. Details of each different wall opening condition.
5. Details of accessories.
6. Details of preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain doors and frames through one source from a single manufacturer wherever possible.

B. Pre-Installation Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Store materials under cover at Project site in accordance with the manufacturer's instructions. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for door 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.

1.8 WARRANTY

A. Provide manufacturer's written warranty against defects in materials and workmanship upon final completion and acceptance of Work in this section. Warranty period is ten years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CECO Door Products.
2. Curries Company.
3. Special-Lite.

B. Substitutions: Material from alternate door and frame fabricators will not be accepted on jobsite without prior written and sample approval in accordance with requirements specified in Division 01.

2.2 MATERIALS

A. Aluminum: 6063-T6 hardened aluminum alloy.

B. Fiberglass Reinforced Plastic Sheet: Thickness of .120” with the finish color for the full thickness of the sheet.

C. Glazing: Comply with requirements in Division 08 Section, "Glazing."

2.3 FIBERGLASS REINFORCED POLYESTER DOORS

A. General: Provide 1-3/4 inch doors of type and design indicated, not less than thickness indicated; fabricated without visible joints or seams on exposed faces unless otherwise indicated.

1. Design: As indicated on the drawings.
2. Core Construction: Five pound density foam-in-place polyurethane core.
3. Stiles and Rails: Extruded aluminum with mitered corners. Provide 3/8” diameter tie rods top and bottom.
4. Faces: Fiberglass reinforced plastic sheets of .120” thickness with a pebble texture.
5. Surface Applied Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6.

2.4 ALUMINUM FRAMES

A. General: Provide frames from extruded tube backer with an applied stop.

1. Fabricate frames with butted ends.
2. Fabricate frames with corner brackets for secure fastening.

3. Stops are to be screw applied and include gasketing.

B. Surface Applied Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6.

2.5 FABRICATION

A. General: Fabricate work to be rigid and free of defects. Accurately form to required sizes and profiles.

B. Fiberglass Reinforced Polyester Doors:

1. Glazed Lites: Factory cut openings in doors with applied flush aluminum trim kit to fit.
2. Top Caps: Close tops of doors flush with aluminum top caps.

C. Aluminum Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

D. Surface Hardware Preparation: Factory prepare work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section, "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors to receive non-template, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of work for hardware.

2.6 FINISHES

A. FRP Door finish shall be:

1. Light Gray.

B. Aluminum finish for stiles and rails, light kits, and door frames shall be:

1. Satin Clear.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prior to installation, check openings for squareness, alignment, twist, and plumbness.

B. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Aluminum Frames: Install aluminum frames of size and profile indicated.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with appropriate mortar.

C. Fiberglass Reinforced Polyester Doors: Fit doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Doors:

   a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
   b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
   c. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with door manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including stainless steel work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from stainless steel work immediately after installation.

C. Remove stains and materials that will have and adverse affect on the doors and frames and restore slight blemishes in accordance with manufacturer’s instructions to match original finish.

END OF SECTION 081613

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Access doors and frames for walls and ceilings.

a. Flush Access Doors and Frames with Exposed Trim
b. Flush Access Doors and Trimless Frames

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of access door and frame indicated.

C. Schedule: Types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.4 COORDINATION

A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers and Products

1. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to following:

Manufacturer	**Framed Access Door Product Number**	**Frameless Access Door Product Number**
J. L. Industries, Inc.	Model TM	Model WB
Karp Assoc., Inc.	Model MC	Model KDW
Larsen’s Mfg Co.	Model L-MPG	Model L-DWC

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Wall and ceiling with adjacent finished gypsum board surface.
2. Door: Minimum 16 gauge thick sheet metal.
3. Frame: Minimum 16 gauge thick sheet metal with 1-inch- (25-mm-) wide, surface-mounted trim.
4. Hinges: Manufacturer's standard
5. Latch(es): Flush and screwdriver activated.

C. Flush Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Wall with adjacent finished applied to gypsum board substrate (ceramic tile, etc.)
2. Door: Minimum 16 gauge thick sheet metal.
3. Frame: Minimum 16 gauge thick sheet metal with drywall bead flange.
4. Hinges: Manufacturer's standard
5. Latch(es): Flush and screwdriver activated.

2.2 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, provide materials with smooth, flat surfaces without blemishes.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.3 STEEL FINISHES

A. Factory priming: Manufacturer's standard.

B. Field-Applied Paint Finish: Field paint all access panel doors and frames in accordance with architectural finish schedule and "Painting" in Division 9 of the specifications

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer prior to field painting of finish coat(s).

END OF SECTION 083113

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SECTION 083323 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes electrically operated overhead coiling insulated doors.

1.3 REFERENCES

A. NFRC 102 - Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.

B. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Element.

C. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

D. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

E. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

F. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

G. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

I. NEMA MG 1 - Motors and Generators.

1.4 PERFORMANCE REQUIREMENTS

A. Overhead coiling insulated doors:

1. Wind Loads: Design door assembly to withstand wind/suction load of 20 psf (958 Pa) without damage to door or assembly components in conformance with ASTM E 330.
2. Operation: Design door assembly, including operator, to operate for not less than 20,000 cycles.

B. Delegated Design: Design sectional doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Single Source Responsibility: Provide doors, tracks, motors, and accessories form one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type and size of overhead coiling door and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Included detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Wiring Diagrams: For power, signal, and control wiring.

D. Color Charts for Initial Selection: Manufacturer's finish charts showing full range of standard colors and textures available for units with factory-applied finishes for selection by Architect.

E. Delegated-Design Submittal: Manufacturer of overhead coiling doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: For qualified Installer provide manufacturer.

G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

B. Warranties: Completed manufacturer’s special warranties as described in the “Warranties” Article of this specification section.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years’ experience in the fabrication and installation of security closures.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project by the manufacturer.

C. Source Limitations: Obtain sectional doors from single source from single manufacturer.

1. Obtain operators and controls from sectional door manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 COORDINATION

A. Coordinate Work with other operations and installation of adjacent materials to avoid damage to installed materials.

1.11 WARRANTY

A. Warranty: Manufacturer’s limited door and operator system, except the counterbalance spring and finish, to be free from defects in materials and workmanship for 3 years or 20,000 cycles, whichever occurs first.

B. Warranty: Manufacturer’s limited door warranty for 2 years for all parts and components.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of Design Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. The Overhead Door Co.; Stormtite Insulated Service Doors – Model 625.

2.2 INSULATED OVERHEAD COILING SERVICE DOORS

A. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.

1. Flat profile type F-265i for doors up to 40 feet (12.19 m) wide.

2. Front slat fabricated of 24 gauge galvanized steel.
3. Back slat fabricated of 24 gauge galvanized steel.
4. Slat cavity filled with CFC-free foamed-in-place, polyurethane insulation.

    a. R-Value: 7.7, U-Value: 0.13.
    b. Sound Rating: STC-21.

B. Performance:

1. Through Curtain Sound Rating: Sound Rating: STC-28 (STC-30+ with HZ noise generator) as per ASTM E 90.
2. Installed System Sound Rating: STC-21 as per ASTM E 90.
3. U-factor: 0.91 NFRC test report, maximum U-factor of no higher than 1.00.

C. Finish:

1. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.

    a. Polyester Top Coat.

        1) White polyester.

    b. Non-galvanized exposed ferrous surfaces shall receive one coat of rust-inhibitive primer.

D. Weatherseals:

1. Vinyl bottom seal, exterior guide and internal hood seals.
2. Interior guide weatherseal.
3. Lintel weatherseal.

E. Bottom Bar:

1. Two galvanized steel angles minimum thickness 1/8 inch (3 mm) bolted back to back to reinforce curtain in the guides.

F. Guides: Three Structural steel angles

1. Finish: PowderGuard Zinc Finish for guides, bottom bar and head plate.

G. Brackets:

1. Galvanized steel to support counterbalance, curtain, and hood.

H. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.

I. Hood: Provide with internal hood baffle weatherseal.

1. 24 gauge galvanized steel with intermediate supports as required.

J. Electric Motor Operation: Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.

1. Sensing Edge Protection:

a. Electric sensing edge.

2. Operator Controls:

a. Push-button operated control stations with open, close, and stop buttons.
b. Controls surface mounted.

3. Special Operation:

a. Radio control operation.
b. Motor Voltage: 208 volt, three phase, 60 Hz.
c. Auxiliary contacts: N.O./N.C., activation upon activation or open command.

K. Locking:

1. Interior slide bolt lock for electric operation with interlock switch.
2. Cylinder lock for electric operation with interlock switch.

L. Wall Mounting Condition:

1. Face-of-wall mounting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify opening sizes, tolerances and conditions are acceptable.

B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 16150. Complete wiring from disconnect to unit components.

F. Install perimeter trim and closures.

G. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

3.4 ADJUSTING

A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.

B. Remove labels and visible markings.

C. Touch-up, repair, or replace damaged products before Substantial Completion.

3.6 PROTECTION

A. Protect installed products until completion of project.

END OF SECTION 083323

SECTION 083330 – ROLLING GRILLES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

B. Provide all labor, materials, and equipment to complete rolling counter grille work as outlined in the Contract Documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. 055000 Metal Fabrications. Structural support for track.

B. 061053 Miscellaneous Rough Carpentry. Structural support for track.

C. 087100 Door Hardware. Masterkeyed cylinders.

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: Submit manufacturer's product data and installation instructions for each type of security grille. Include both published data and any specific data prepared for this project.

C. Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors and accessories. Include relationship with adjacent materials.

1.4 QUALITY ASSURANCE

A. Manufacturer: Rolling counter grilles shall be manufactured by a firm with a minimum of five years experience in the fabrication and installation of security grilles. Manufacturers proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past five years.

B. Installer: Installation of security grilles shall be performed by an authorized representative of the manufacturer.

C. Single-Source Responsibility: Provide grilles, guides, motors, and related primary components from one manufacturer for each type of grille. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures, and construction operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Basis-of-Design: Cornell Iron Works, Inc.; Model ESG-30 - VisionGlide
2. Cookson Company
3. Overhead Door Corporation.

2.2 ROLLING GRILLES

A. Curtain:

1. Vertical Tubes: 8 mm (5/16 inch) diameter, 6063 T5 aluminum alloy, 89 mm (3.5 inches) on center.
2. Tube Spacers: 11 mm (7/16 inch) outside diameter [PVC] [aluminum] tubes to maintain horizontal chain spacing.
3. Horizontal Chains: Aluminum links, 3 mm x 16 mm x 197 mm (1/8 inch x 5/8 inch x 7-3/4 inches), Links to be vertically spaced at 152 mm (6 inches) o.c. in a brick pattern.
4. Hinge Panels: 51 mm (2 inch) high continuous interlocking aluminum panels at the top and bottom of the closure.
5. Leading End Member: 33 x 60 x 3 mm (1 5/16 x 2 3/8 x 1/8 inch) thick extruded aluminum tube with recess for attaching curtain sections.
6. Provide concealed masterkeyable, cylinder operated hook-bolt #7 member with lock operable from public side of curtain; thumbturn cylinder lock operable from tenant side of curtain that engages a full height wall channel. Provide rubber bumper at the edge of the locking member.
7. Intermediate Member(s): 33 x 60 x 3 mm (1 5/16 x 2 3/8 x 1/8 inch) thick extruded aluminum tube with recess for attaching curtain sections.
8. Provide concealed masterkeyable, cylinder operated, bottom ratcheted rod #3 member with lock operable from public side of curtain. Supply dustproof floor sockets for all drop bolts. Provide rubber bumper at the edge of the locking member.
9. Trailing End Member: 33 x 60 x 3 mm (1 5/16 x 2 3/8 x 1/8 inch) thick extruded aluminum tube with recess for attaching curtain sections.
10. Provide #8 fixed end member.

B. Trolleys: 29 mm (1 1/8 inch) diameter nylon tired ball bearing wheels; two wheel assembly at each hanger; three wheel assembly at all vertical members.

C. Track: 33 x 46 mm (1.3 x 1.8 inch) thick extruded aluminum section with continuous recess for splice tongues and pins.

1. Provide a curved track section(s) with a 6756 mm (22’-2”) radius.

D. Finishes: Anodized Aluminum.

2.3 ACCESSORIES

A. Pocket Door(s):

1. Door

    a. Material: A36 HR steel
    b. Thickness: USS 12-gauge
    c. Finish: Phosphate treatment followed by a light gray baked-on polyester powder coat; minimum 0.065 mm (2.5 mils) cured film thickness.
    d. Size: Rough opening minus 20.6 mm (13/16")

2. Frame

    a. Material: A36 HR steel
    b. Thickness: USS 12-gauge steel
    c. Finish: Phosphate treatment followed by a light gray baked-on polyester powder coat; minimum 0.065 mm (2.5 mils) cured film thickness.
    d. Size: Overlaps opening 50.8 mm (2") with a 15.9 mm (5/8") projection off wall

3. Hinges: 76.2 mm (3") non-mortise type
4. Lock: 25.4 mm (1") security mortise cylinder

2.4 FABRICATION

A. Fabricate with every fourth vertical rod as a hanger rod. Provide tube spacers at each hanger rod to maintain chain spacing.

B. Hinge Panels: Continuous rows between top two and bottom two chain sets.

C. Intermediate Members: Spacing not to exceed 3.05 M (10 feet) on center and located at each curve.

D. Bi-Parting Grilles: Attach strike channel to appropriate curtain section.

2.5 OPERATION

A. Manual push-pull.

PART 3 - EXECUTION

3.1 INSPECTION

A. Take field dimensions and examine conditions of substrates, supports and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Strictly comply with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

B. Instruct Government's personnel in proper operating procedures and maintenance schedule.

3.3 ADJUST AND CLEAN

A. Test security grilles for proper operation and adjust as necessary to provide proper operation without binding or distortion.

B. Touch-up damaged coatings and finishes and repair minor damage. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned.

C. Clean premises of all litter, dirt and debris created by work of this Section. Leave premises broom clean.

END OF SECTION 083330

SECTION 083613 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes sectional overhead doors with one or more of the following attributes. Reference door schedule each door's specific requirements.

1. Insulated exterior sectional overhead doors
2. Electric Operators and Controls
3. Operating Hardware, tracks, and support.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Delegated Design: Design sectional doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Single Source Responsibility: Provide doors, tracks, motors, and accessories form one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

D. Structural Performance: Exterior sectional doors shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Wind Loads: ANSI/DASMA10 standards and as required by code.
2. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components. Deflection of door in horizontal position (open) shall not exceed 1/120 of the door width.

E. Air Infiltration: Maximum rate not more than indicated when tested according to DASMA 105.

F. Operation Cycles: Provide sectional door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.4 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type and size of sectional door and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

C. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Included detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. Wiring Diagrams: For power, signal, and control wiring.

D. Color Charts for Initial Selection: Manufacturer's finish charts showing full range of standard colors and textures available for units with factory-applied finishes for selection by Architect.

E. Delegated-Design Submittal: Manufacturer of sectional doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Qualification Data: For qualified Installer provide manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sectional doors to include in maintenance manuals.

B. Warranties: Completed manufacturer’s special warranties as described in the “Warranties” Article of this specification section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project by the manufacturer.

B. Source Limitations: Obtain sectional doors from single source from single manufacturer.

1. Obtain operators and controls from sectional door manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Standard for Sectional Doors: Fabricate sectional doors to comply with DASMA 102 ANSI/DSMA 102 - American National Standard Specifications for Sectional Overhead Type Doors unless otherwise indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

1.8 WARRANTY

A. Special Warranty: Manufacturer's limited door and operators System warranty for 10 years against delamination of polyurethane foam from steel face and all other components for 3 years or 20,000 cycles, whichever comes first.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of Design Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. The Overhead Door Co.; 591 Series Thermacore Insulated Steel Door.

2.2 INSULATED EXTERIOR SECTIONAL OVERHEAD DOOR ASSEMBLY

A. Door Assembly: Metal/foam/metal sandwich panel construction, with PVC thermal break and weather-tight ship-lap design meeting joints.

1. Panel Thickness (Nominal): 2-inches: (50-mm).
2. Exterior Surface: Ribbed, textured.
3. Exterior Steel: 0.015-inch (0.38-mm), hot-dipped galvanized
4. End Stiles: 16 gauge, galvanized.
5. Spring Counterbalance: Sized to weight of door, with a helically wound, oil tempered torsion spring mounted on a steel shaft, cable drum of die cast aluminum with high strength galvanized aircraft cable. Sized with a minimum 7 to 1 safety factor.

    a. Standard cycle spring: 10,000 cycles.

6. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
7. Thermal Values: R-value of 14.86; U-value of 0.067.
8. Air Infiltration 0.08 cfm at 15 mph; 0.08 cfm at 25 mph
9. Steel Sections: Zinc-coated (galvanized) steel sheet.
10. Full Glazed Aluminum Sash Panels
    a. ¼" Clear Polycarbonate

11. Finish and Color:

    a. Baked on Kynar polyvinylidene floruoride high performance coating.

1) Interior Color: White
2) Exterior Color: As selected by Architect from manufacturer's chart of standard colors.

12. Weatherstripping:

a. EPDM bulb-type strip at bottom section.
b. Flexible Jamb seals.
c. Flexible Header seals.

13. Door Finish:

a. Baked-Enamel or Powder-Coated Finish: Color and gloss as selected by Architect from manufacturer's full range.
b. Finish of Interior Facing Material: Color and glass as selected by Architect from manufacturer's full range.

14. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
15. Lock: Interior mounted slide lock.
16. Track Size: Provide track as recommended by manufacturer to suit loading required and clearances available
17. Track Type: Reference door schedule on drawings for each sectional overhead door.
18. Push/Pull Handles: For push-up or emergency-operated doors, provide galvanized-steel lifting handles on each side of door.

2.3 ELECTRIC DOOR OPERATORS

A. Basis-of Design Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. The Overhead Door Co.; RSX Standard Duty Commercial Operator.

B. Wiring Connections: Requirements for electrical characteristics.

1. 208 volts, three phase, 60 Hz.

C. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.

1. Entrapment Protection: Required for momentary contact, includes radio control operation.

a. Photoelectric sensors monitored to meet UL 325/2010.

2. Operator Controls:

a. Push-button operated control stations with open, close, and stop buttons.
b. Surface mounting.
c. Interior location.

3. Special Operation:

a. Pull switch.
b. Radio control operation.

D. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

E. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

F. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.4 CLEANING AND ADJUSTING

A. Adjust door assembly to smooth operation and in full contact with weatherstripping.

B. Clean doors, frames and glass.

C. Remove temporary labels and visible markings.

3.5 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION 083613

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior and interior storefront framing systems.
2. Exterior and interior manual-swing entrance doors and door-frame units.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferring to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
d. Noise or vibration created by wind and by thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units.

B. Structural Loads:

1. Wind Loads.

a. Basic Wind Speed: 90 mph (40 m/s).
b. Importance Factor: 1

c. Exposure Category: C.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans 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) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.

D. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

F. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (300 Pa).

G. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft. (300 Pa).

1. Maximum Water Leakage: No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.

H. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

    a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 160 deg F.
    b. Low Exterior Ambient-Air Temperature: minus 10 deg F.

3. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

I. Condensation Resistance Factor: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 76 when tested according to AAMA 1503.

J. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.33 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.

K. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:

1. Sound Transmission Class (STC): 31 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
2. Outdoor-Indoor Transmission Class (OITC): 25 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

1.5 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

C. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. Hardware for entrance doors: Submit entrance door hardware as part of Hardware Schedule and submittal requirements specified in Section 087100.

D. Samples for Selection: Manufacturer’s samples for selection by the Architect.

E. Installer’s Qualification: Letter from manufacturer stating the installer is an authorized installer of products listed in this section.

F. Warranties: Sample of each warranty required in “Warranty” Article.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

C. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

D. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty for all components must be direct from the manufacturer (non pass-through) and non pro-rated for the entire term. Warranty must be assignable to the non-residential owner, and transferable to subsequent owners through its length.
2. Failures include, but are not limited to, the following:

    a. Structural failures including, but not limited to, excessive deflection.
    b. Noise or vibration caused by thermal movements.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    d. Water leakage through fixed glazing and framing areas.
    e. Failure of operating components.

3. Warranty Period: 10 years from date of Substantial Completion.

B. Installer Warranty:

1. Submit a written warranty, executed by the curtainwall installer, for a period of (5) five years from the date of substantial completion, against defective materials or workmanship, including substantial non-compliance with applicable specification requirements, which result in premature failure.

2. In the event that installation of curtainwall or components is found to be defective, installer will repair or provide replacements without charge at the installer's option.

C. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer and Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Wausau Window and Wall Systems

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of 0.125” minimum thickness and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. 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.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.

E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Section 088000 "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

1. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers for this use.

2.5 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-inch overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: Medium stile; 3.5 to 4-inch (88.9-mm) nominal width.
3. Bottom Rail: 10-inch for accessibility requirements
4. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: As specified in Section 087100 "Door Hardware" except weatherstripping and weather sweeps.

A. Weatherstripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

B. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 079200 "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.7 FABRICATION

A. Finish, fabricate and factory assemble Exterior Sun Control System, Curtainwall and Storefront and Entrance Systems under the responsibility of a single manufacturer, with units sized for ease of shipping, distribution and erection.

B. Form or extrude aluminum shapes before finishing.

C. 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.

D. Framing Members, General: 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. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

E. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

F. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

H. Entrance Doors: Reinforce doors as required for installing entrance door hardware specified in Section 087100 "Door Hardware."

2.8 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker, as selected by Architect from manufacturer's color samples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
2. Alignment:

    a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
    b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.4 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

B. Remove protective material from prefinished aluminum surfaces.

C. Remove excess sealant and glazing compounds, and dirt from surfaces.

3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

B. Replace components damage, including scarring of finish on exposed aluminum, during installation, glazing, or cleaning. Field touch up with applied materials will not be accepted.

END OF SECTION 084113

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes operable aluminum-framed windows for exterior locations.

1.3 DEFINITIONS

A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS:

1. AW: Architectural.

B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:

1. Design pressure number in pounds force per square foot (pascals) used to determine the structural test pressure and water test pressure.

C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of minimum test size indicated below:

1. Size indicated on Drawings.

B. Structural Performance: Provide aluminum windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour (meters per second) at 33 feet (10 m) above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

a. Basic Wind Speed: 90 mph (40 m/s).
b. Importance Factor: As indicated on Drawings.
c. Exposure Category: As indicated on Drawings.

2. Deflection: Design glass framing system to limit lateral deflections of glass edges to less than 1/175 of glass-edge length or 3/4 inch (19 mm), whichever is less, at design pressure based on testing performed according to AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Deflection Test or structural computations.

C. Windborne-Debris Resistance: Provide glazed windows capable of resisting impact from windborne debris, based on the pass/fail criteria as determined from testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 or AAMA 506 and requirements of authorities having jurisdiction.

D. Thermal Movements: Provide aluminum windows, 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 (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:

1. Joinery details.
2. Expansion provisions.
3. Thermal-break details.
4. Glazing details.
5. Window cleaning provisions.
6. Window System Operators: Show locations, mounting, and details for installing operator components
7. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum windows and used to determine the following:

    a. Structural test pressures and design pressures from wind loads indicated.
    b. Deflection limitations of glass framing systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

1. Installer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of data for aluminum windows, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

C. Source Limitations: Obtain aluminum windows through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements." Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Contracting Officer, except with Contracting Officer's approval. If modifications are proposed, submit comprehensive explanatory data to Contracting Officer for review.

E. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum 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, air infiltration, or condensation.
c. Faulty operation of movable sash and hardware.
d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: Three years from date of Substantial Completion.
b. Glazing: Five years from date of Substantial Completion.
c. Metal Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EFCO Corporation.
2. Kawneer; an Alcoa Company.
3. Wausau Window and Wall Systems.
4. Or Equal: Qualification data for "or Equal" manufacturers and products shall be made at time of submittal during construction. Preapproval will not be performed by the Government

2.2 WINDOW

A. Basis of Design Window Type:

1. Wausau Windows and Wall System, 2250 Series.

B. Aluminum windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/NAFS unless more stringent performance requirements are indicated.

1. Performance Class and Grade: HC 50.

C. Thermal Transmittance: Provide aluminum windows with a whole-window, U-factor maximum indicated at 15-mph (24-km/h) exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.

1. U-Factor: 0.31 Btu/sq. ft. x h x deg F (2.3 W/sq. m x K) or less.

D. Solar Heat-Gain Coefficient (SHGC): Provide aluminum windows with a whole-window SHGC maximum of 0.43, determined according to NFRC 200 procedures.

E. Window Accessories:

1. Formed steel slide-in anchors.
2. Rigid PVC Caulk Backer.

2.3 GLAZING

A. Glass and Glazing Materials:

1. Insulating Glass: Shall be 1" overall thickness, see Section 088100 – Glass and Glazing.

2.4 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

C. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.
2. Provide thermal barriers tested according to AAMA 505; determine the allowable design shear flow per the appendix in AAMA 505.
3. Provide hardware with low conductivity or nonmetallic material for hardware bridging thermal breaks at frame or vent sash.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.

F. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.

G. Glazing Stops: Provide snap-on glazing stops coordinated with Division 8 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.5 FINISHES, GENERAL

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.

2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Architect from full range of industry colors and color densities.

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. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
3. 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 windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

END OF SECTION 085113

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SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.
2. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Door Hardware Schedule”.
2. Division 08 Section “Hollow Metal Doors and Frames”.
3. Division 08 Section “Interior Aluminum Doors and Frames”.
4. Division 08 Section “Flush Wood Doors”.
5. Division 08 Section “Fiberglass Doors”,

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards:

1. ANSI/BHMA Certified Product Standards - A156 Series
2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

   a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.
   c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary Integrated Wiegand Access Control Products.

E. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified installer of Windstorm assemblies.

F. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

G. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

H. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Integrated Wiegand, Wireless, and IP-Enabled Access Control Products Supplier Qualifications: Integrated access control products and accessories are required to be supplied and installed through current members of the ASSA ABLOY "Authorized Channel Partner" (ACP) and "Certified Integrator" (CI) programs. Suppliers are to be

factory trained, certified prior to project bid, and a direct purchaser of the specified product. Installers are to be factory trained, certified prior to project bid, and are responsible for commissioning, servicing, and warranting the installed equipment specified for the project.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Seven years for heavy duty cylindrical (bored) locks and latches.
3. Five years for exit hardware.
4. Twenty five years for manual surface door closer bodies.
5. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity, unless otherwise indicated:

a. Two Hinges: For doors with heights up to 60 inches.
b. Three Hinges: For doors with heights 61 to 90 inches.
c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
   b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:

   a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

Acceptable Manufacturers:

   b. Hager Companies (HA).
   c. McKinney Products (MK).
   d. Stanley Hardware (ST).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge. with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Acceptable Manufacturers:

   a. McKinney Products (MK).
   b. Pemko Manufacturing (PE).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Acceptable Manufacturers:

   a. Hager Companies (HA) - ETW-QC (# wires) Option.
   b. McKinney Products (MK) - QC (# wires) Option.

B. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Acceptable Manufacturers:

   a. Securitron (SU) - EL-CEPT Series.
   b. Von Duprin (VD) - EPT-10 Series.

C. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Acceptable Manufacturers:

   a. Adams Rite (AD) – 4612 Series.
   b. Securitron (SU) - EL-EPT Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Acceptable Manufacturers:

   a. Door Controls International (DC).
   b. Rockwood Manufacturing (RO).
   c. Trimco (TC).

B. Coordinators: ANSI/BHMA A156.3 certified door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Acceptable Manufacturers:

   a. Door Controls International (DC).
   b. Rockwood Manufacturing (RO).
   c. Trimco (TC).

C. Door Push Plates and Pulls: ANS/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

    a. Acceptable Manufacturers:

        1) Rockwood Manufacturing (RO).
        2) Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinders: Original manufacturer cylinders complying with the following:

1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
5. Keyway: Match Facility Standard.

D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.

E. Patented Cylinders: ANSI/BHMA A156.5, Grade 1, certified patented cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer’s United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.

1. Acceptable Manufacturers:

    a. Medeco (MC) - X4 Series.
    b. No Substitution.

F. Keying System: Each type of lock and cylinders to be keyed by the Owner's rep, Capital Lock, Inc – 608-256-5625.

G. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Three (3).
2. Construction Keys (where required): Ten (10).
3. Construction Control Keys (where required): Two (2).
4. Permanent Control Keys (where required): Two (2).

H. Construction Keying: Provide temporary keyed construction cores.

I. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Acceptable Manufacturers:

    a. Lund Equipment (LU).
    b. MMF Industries (MM).
    c. Telkee (TK).

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Acceptable Manufacturers:

    a. Corbin Russwin Hardware (RU) – ML2000 Series.
    b. Sargent Manufacturing (SA) – 8200 Series.
    c. Yale Locks and Hardware (YA) – 8800FL Series.

B. Lock Trim Design: As specified in Hardware Sets.

2.7 INTEGRATED WIEGAND OUTPUT ACCESS CONTROL LOCKING DEVICES

A. Integrated Wiegand Output Mortise Locks: Wiegand output ANSI A156.13, Grade 1, mortise lockset with integrated proximity card reader, request-to-exit signaling, door position status switch, and latchbolt monitoring in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle trim, 3/4" deadlocking anti-friction latch, and 1" case-hardened steel deadbolt. Lock is U.L listed and labeled for use

on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.

1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Latchbolt monitoring and door position switch act in conjunction to report door-in-frame (DPS) and door latched (door closed and latched) conditions.
2. Reader supports either HID 125 kHz proximity (up to 39 bits, including Corporate 1000) or 13.56 MHz (2K-32K) iClass® credentials.
3. 12VDC external power supply required for reader and lock, with optional 24VDC operation available with iClass® reader (125 kHz reader is always 12VDC). Fail safe or fail secure options.
4. Installation requires only one cable run from the lock to the access control panel without requirements for additional proprietary lock panel interface boards or modules.
5. Installation to include manufacturer's access control panel interface board or module where required for Wiegand output protocol.

    a. Acceptable Manufacturers:

        1) Corbin Russwin Hardware (RU) - Access 600 - ML20600 RNE1 Series.
        2) Sargent Manufacturing (SA) - Harmony - H1/H2 8200 Series.
        3) Yale Locks and Hardware (YA) - Symphony - S8800 SYM Series.

2.8 AUXILIARY LOCKS

A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.5, Grade 1, certified small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Acceptable Manufacturers:

    a. Corbin Russwin Hardware (RU) - DL4100 Series.
    b. Sargent Manufacturing (SA) - 4870 Series.
    c. Yale Locks and Hardware (YA) - 350 Series.

2.9 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.5.
4. Dustproof Strikes: BHMA A156.16.

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.

    a. Fire Exit Removable Mullions: Provide keyed removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions to be used only with exit devices for which they have been tested.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is not acceptable except in any case where the door light extends behind the device as in a full glass configuration.
5. Flush End Caps: Provide heavy weight impact resistant flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with four threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets. Provided free-wheeling type trim where indicated.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Provide and install interior surface and concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Mounting rails to be formed from smooth stainless steel, brass or bronze architectural materials no less than 0.072" thick, with push rails a minimum of 0.062" thickness. Painted or aluminum metal rails are not acceptable. Exit device latch to be investment cast stainless steel, pullman type, with deadlock feature.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
b. Sargent Manufacturing (SA) - 80 Series.
c. Von Duprin (VD) - 35A/98 XP Series.

2.11 ELECTROMECHANICAL CONVENTIONAL EXIT DEVICES

A. Electrified Conventional Push Rail Devices (Heavy Duty): Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified below. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
b. Sargent Manufacturing (SA) - 80 Series.
c. Von Duprin (VD) - 35A/98/99 Series.

B. Electrified Options: As indicated in hardware sets, provide electrified exit device options including: electric latch retraction (shall be motorized type that fully retracts the touchpad/push bar), electric dogging, outside door trim control, exit alarm, latchbolt monitoring, lock/unlock status monitoring, touchbar monitoring and request-to-exit signaling. Unless otherwise indicated, provide electrified exit devices standard as fail secure.

2.12 INTEGRATED WIEGAND OUTPUT ACCESS CONTROL EXIT DEVICES

A. Wiegand Output Integrated Card Reader Exit Hardware: Wiegand output ANSI 156.3 Grade 1 rim, mortise, and vertical rod exit device hardware with integrated proximity card reader, latchbolt and touchbar monitoring, and request-to-exit signaling, in one complete unit. Hard wired, solenoid driven locking/unlocking control of the lever handle exit trim with 3/4" throw latch bolt. U.L listed and labeled for either panic or "fire exit hardware" for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.

1. Open architecture, hard wired platform supports centralized control of locking units with new or existing Wiegand compatible access control systems. Inside

push bar (request-to-exit) signaling and door position (open/closed status) monitoring (via separately connected DPS).

2. Reader supports either HID 125 kHz proximity (up to 39 bits, including Corporate 1000) or 13.56 MHz (2K-32K) iClass® credentials.
3. 12VDC external power supply required for reader, with optional 24VDC operation available with iClass® reader (125 kHz reader is always 12VDC). 24VDC required for solenoid operated exit trim (12VDC if applicable). Fail safe or fail secure options.
4. Installation requires only one cable run from the exit hardware to the access control panel without requirements for additional proprietary lock panel interface boards or modules.

5. Acceptable Manufacturers:

    a. Corbin Russwin Hardware (RU) - Access 600 - ED5000 RNE1 Series.
    b. Sargent Manufacturing (SA) - Harmony - H1/H2 80 Series.

2.13 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

    a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
    b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
    c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
    d. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics. Provide drop plates or other accessories as required for proper mounting.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - DC8000 Series.
b. Sargent Manufacturing (SA) - 351 Series.
c. Norton Door Controls (NO) - 7500 Series.

2.14 AUTOMATIC DOOR OPERATORS

A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Electrohydraulic Door Operators: Self-contained low-pressure units with rack and pinion design contained within a cast aluminum housing. Door closing speed controlled by independent hydraulic adjustment valves in the sweep and latch range of the closing cycle. Operator is to provide conventional door closer opening and closing forces unless the power operator motor is activated. Unit is to include an adjustable hydraulic backcheck valve to cushion the door speed if opened violently. Non-handed units for both push and pull side applications.

C. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

D. Standard: Certified ANSI/BHMA A156.19.

1. Performance Requirements:

a. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
b. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.

E. Configuration: Surface mounted. Door operators to control single swinging and pair of swinging doors.

F. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

1. On-off switch to control power to be key switch operated.

G. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

H. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

I. Activation Devices: Provide activation devices in accordance with ANSI/BHMA A156.19 standard, for condition of exposure indicated and for long term, maintenance free operation under normal traffic load operation. Coordinate activation control with electrified hardware and access control interfaces. Activation switches are standard SPST, with optional DPDT availability.

J. Signage: As required by cited ANSI/BHMA A156.19 standard for the type of operator.

1. Acceptable Manufacturers:

a. Norton Door Controls (NO) - 6000 Series.
b. Stanley Access (ST) - Magic Force Series.

2.15 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), beveled on four edges (B4E), fabricated from the following:

a. Stainless Steel: 300 series, 050-inch thick, with countersunk screw holes (CSK).

4. Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets.
5. Metal Door Edging: Door protection edging fabricated from a minimum .050-inch thick metal sheet, formed into an angle or "U" cap shapes, surface or mortised

mounted onto edge of door. Provide appropriate leg overlap to account for protection plates as required. Height to be as specified in the Hardware Sets.

6. Acceptable Manufacturers:

    a. Rockwood Manufacturing (RO).
    b. Trimco (TC).

2.16 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Acceptable Manufacturers:

    a. Rockwood Manufacturing (RO).
    b. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Acceptable Manufacturers:

    a. Rixson Door Controls (RF).
    b. Rockwood Manufacturing (RO).
    c. Sargent Manufacturing (SA).

2.17 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Acceptable Manufacturers:

1. National Guard Products (NG).
2. Pemko Manufacturing (PE).
3. Reese Enterprises, Inc. (RS).

2.18 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Acceptable Manufacturers:

a. Sargent Manufacturing (SA) – 3280 Series.
b. Securitron (SU) - DPS Series.

B. Proximity Access Cards and Credentials: RF programmable, 125 kHz access control/identification cards utilizing a passive, no battery design allowing for infinite number of reads. Cards are programmable in any HID proximity format up to 85 bits and compatible with all HID proximity readers.

1. Acceptable Manufacturers (125 kHz Proximity):

a. Corbin Russwin Hardware (RU) - 794F Series.
b. Sargent Manufacturing (SA) - PCH Series.

C. Wiegand Test Unit: Test unit verifies proper Wiegand output integrated card reader lock installation in the field by testing for proper wiring, card reader data integrity, and lock functionality including lock/unlock, door position, and request-to-exit status. 12 or 24VDC voltage adjustable operating as Fail Safe or Fail Secure.

1. Acceptable Manufacturers:

a. Corbin Russwin Hardware (RU) - WT1 Wiegand Test Unit.
b. Sargent Manufacturing (SA) - WT1 Wiegand Test Unit.

D. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:

a. Securitron (SU) - BPS Series.

E. Energy Efficient Switching Power Supplies: Provide UL listed or recognized filtered and regulated power supplies. Provide single voltage units as shown in the hardware sets. Units must have one access control input and one fire alarm input. Standby power consumption of unit must be less than 10mW at 120VAC. Provide integral battery backup as standard for all units. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

1. Acceptable Manufacturers:

a. Securitron (SU) – EPS Series.

2.19 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SCHEDULE

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RO - Rockwood
5. SA - Sargent
6. MC - Medeco
7. RF - Rixson

8. NO - Norton
9. 00 - Other

Hardware Schedule

Set: 1.0

1	New lock or Cylinder	Verify existing lock type	US26D	SA
1	Removable Core	33N700006	26	MC

Set: 2.0

1	Continuous Hinge (AL, power trans)	CFM83SLI-HD3 EL-EPT-SC		PE
1	Access Control Rim Exit	12 56-H1-8810 ETL	US32D	SA
1	Removable Core	33N700006	26	MC
1	Door Closer	CPS7500	689	NO
1	Threshold	2009APKx Width		PE
1	Gasketing	312CR LAR		PE
1	Sweep	315CN x Width		PE
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK
1	ElectroLynx Frame Wire Harness	QC-C1500		MK

Notes: Wiring and connections by security provider.
Provide a wire diagram for each condition and tape to the inside of the power supply for the opening.

Set: 3.0

1	Continuous Hinge (AL, power trans)	CFM83SLI-HD3 EL-EPT-SC		PE
1	Exit Device Rim (nl, el)	53 55 56 70 8804 862	US32D	SA
1	Removable Core	33N700006	26	MC
1	Pull	RM201	US32D	RO
1	Concealed Overhead Stop	1-X36 size accordingly	630	RF
1	Door Operator	6020	689	NO
2	Actuator	505		NO
1	Threshold	278x224AFGT x length as required		PE
1	Sweep	315CN x Width		PE

1	ElectroLynx Harness	QC-Cxxx sized for door width		MK
1	Door Contact	3287		SA
1	ElectroLynx Frame Wire Harness	QC-C1500		MK
1	Prox Reader	4303		SA
1	Position Switch	DPS-M-WH		SU
1	Power Supply	BPS-12/24-1		SU

Notes: Weatherstriping by Alum Door manufacture
Wiring and connections by security provider.
Provide a wire diagram for each condition and tape to the inside of the power supply for the opening.

After hours a valid card read will release active leaf to allow access. Access control system or valid card read will active/de-active the outside Actuator.

Set: 4.0

1	Continuous Hinge (AL Doors)	CFM83SLIHD3 x Height Required	CL	PE
1	Exit Device Rim (EO)	8810	US32D	SA
1	Pull	RM201	US32D	RO
1	Door Closer	CPS7500	689	NO
1	Threshold	2009APKx Width		PE
1	Overhead Rain Drip	346C 4" plus Door width		PE
1	Gasketing	312CR LAR		PE
1	Sweep	315CN x Width		PE
1	Door Contact	3287		SA

Notes: Door contact for monitoring door position.

Set: 4.1

1	Continuous Hinge (AL Doors)	CFM83SLIHD3 x Height Required	CL	PE
1	Storeroom Lock	70 8204 LNL	US32D	SA
1	Removable Core	33N700006	26	MC
1	Door Closer	CPS7500	689	NO
1	Threshold	2009APKx Width		PE
1	Overhead Rain Drip	346C 4" plus Door width		PE
1	Gasketing	312CR LAR		PE
1	Sweep	315CN x Width		PE
1	Door Contact	3287		SA

Notes: Door contact for monitoring door position.

Set: 5.0

10	BB Hinge NRP	TA2714 4-1/2" x 4-1/2" NRP	US26D	MK
1	Constant Latching Flush Bolt Set	2845/2945 to suite dr mtl	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Storeroom Lock	70 8204 LNL	US32D	SA
1	Removable Core	33N700006	26	MC
1	Coordinator	2672	US28	RO
2	Mounting Bracket	2601AB or 2601C as required	Black	RO
2	Door Closer	CPS7500	689	NO
1	Threshold	278x224AFGT x length as required		PE
1	Overhead Rain Drip	346C 4" plus Door width		PE
1	Gasketing	312CR LAR		PE
2	Sweep	315CN x Width		PE
1	Astragal (Overlapping)	357SP x Height		PE

Set: 6.0

6	BB Hinge NRP	TA2714 4-1/2" x 4-1/2" NRP	US26D	MK
1	Electric Power Transfer	CEPT-10		SU
1	Automatic Flush Bolt	2842/2942 to suit dr mtl	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Integrated Card Reader Lock	70 H1-82271 LNL	US26D	SA
1	Removable Core	33N700006	26	MC
1	Coordinator	2672	US28	RO
2	Door Closer	7500 provide arm as required	689	NO
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Wall Stop	406/409 to suit	US32D	RO
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK
1	ElectroLynx Frame Wire Harness	QC-C1500		MK

Notes: Wiring and connections by security provider.
Card Reader, RX and Door Contact are all inclusive in the lock.

Set: 7.0

5	BB Hinge NRP	TA2714 4-1/2" x 4-1/2" NRP	US26D	MK
1	Electric Hinge	TA2714 4-1/2" x 4-1/2" QC12	US26D	MK
1	Automatic Flush Bolt	2842/2942 to suit dr mtl	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Integrated Card Reader Lock	70 H1-82271 LNL	US26D	SA
1	Removable Core	33N700006	26	MC
1	Coordinator	2672	US28	RO
2	Door Closer	7500 provide arm as required	689	NO
2	Kick Plate	K1050 10" 4BE CSK	US32D	RO
2	Wall Stop	406/409 to suit	US32D	RO
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK
1	ElectroLynx Frame Wire Harness	QC-C1500		MK

Notes: Card Reader, wiring and connections by security provider.

Set: 8.0

6	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
2	Manual Flush Bolts	555/557 to suit door type	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Passage Set	8215 LNL	US32D	SA
1	Door Closer	7500 provide arm as required	689	NO
2	Wall Stop	406/409 to suit	US32D	RO
2	Silencer - Metal Frame	608		RO

Set: 9.0

6	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Automatic Flush Bolt	2842/2942 to suit dr mtl	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Passage Set	8215 LNL	US32D	SA
1	Coordinator	2672	US28	RO
2	Mounting Bracket	2601AB or 2601C as required	Black	RO
2	Door Closer	CPS7500	689	NO
1	Saddle Threshold	171Ax Width		PE
1	Gasketing	312CR LAR		PE
2	Sweep	315CN x Width		PE

1	Astragal (Meeting Stile)	S771BL x Height		PE

Set: 10.0

3	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Exit Device (exit only, RX)	55 8810	US32D	SA
1	Door Closer	PR7500	689	NO
1	Wall Stop	406/409 to suit	US32D	RO
3	Silencer - Metal Frame	608		RO
1	Door Contact	3287		SA

Notes: RX switch in the panic will momentarily shunt the door contact.

Set: 11.0

1	Continuous Hinge (AL Doors)	CFM83SLIHD3 x Height Required	CL	PE
1	Fire exit device Rim (passage)	12 8815 ETL	US32D	SA
1	Door Closer	7500 provide arm as required	689	NO
1	Wall Stop	406/409 to suit	US32D	RO
1	Gasketing - Smoke Seal	S88BL LAR		PE

Set: 11.1

3	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Fire exit device Rim (passage)	12 8815 ETL	US32D	SA
1	Door Closer	7500 provide arm as required	689	NO
1	Wall Stop	406/409 to suit	US32D	RO
1	Gasketing - Smoke Seal	S88BL LAR		PE

Set: 12.0

3	BB Hinge NRP	TA2714 4-1/2" x 4-1/2" NRP	US26D	MK
1	Electric Power Transfer	CEPT-10		SU
1	Access Control Rim Exit	12 56-H1-8810 ETL	US32D	SA
1	Removable Core	33N700006	26	MC
1	Door Closer	PR7500	689	NO

1	Wall Stop	406/409 to suit	US32D	RO
1	Gasketing - Smoke Seal	S88BL LAR		PE
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK
1	ElectroLynx Frame Wire Harness	QC-C1500		MK
1	Power Supply	BPS-12/24-1		SU

Notes: Wiring and connections by security provider.
Always free to exit from the stairs. Must have a valid card read to enter the stair.
Card Reader, RX and Door Contact are all inclusive in the Panic trim.

Set: 13.0

1	Continuous Hinge (AL, power trans)	CFM83SLI-HD3 EL-EPT-SC		PE
1	Access Control Rim Exit	12 56-H1-8810 ETL	US32D	SA
1	Removable Core	33N700006	26	MC
1	Door Closer	PR7500	689	NO
1	Wall Stop	406/409 to suit	US32D	RO
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK
1	ElectroLynx Frame Wire Harness	QC-C1500		MK
1	Power Supply	BPS-12/24-1		SU

Notes: Wiring and connections by security provider.
Always free to exit from the hallway. Must have a valid card read to enter the hallway.
Card Reader, RX and Door Contact are all inclusive in the Panic trim.

Set: 14.0

3	BB Hinge NRP	TA2714 4-1/2" x 4-1/2" NRP	US26D	MK
1	Electric Power Transfer	CEPT-10		SU
1	Integrated Card Reader Lock	70 H1-82271 LNL	US26D	SA
1	Removable Core	33N700006	26	MC
1	Door Closer	7500 provide arm as required	689	NO
1	Wall Stop	406/409 to suit	US32D	RO
1	Gasketing - Smoke Seal	S88BL LAR		PE
3	Silencer - Metal Frame	608		RO
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK
1	ElectroLynx Frame Wire Harness	QC-C1500		MK

Notes: Wiring and connections by security provider.
Smoke Seal at doors S-1A & 201 only

Set: 15.0

2	BB Hinge NRP	TA2714 4-1/2" x 4-1/2" NRP	US26D	MK
1	Electric Hinge	TA2714 4-1/2" x 4-1/2" QC12	US26D	MK
1	Integrated Card Reader Lock	70 H1-82271 LNL	US26D	SA
1	Removable Core	33N700006	26	MC
1	Door Closer	7500 provide arm as required	689	NO
1	Wall Stop	406/409 to suit	US32D	RO
1	Gasketing - Smoke Seal	S88BL LAR		PE
3	Silencer - Metal Frame	608		RO
1	ElectroLynx Harness	QC-Cxxx sized for door width		MK
1	ElectroLynx Frame Wire Harness	QC-C1500		MK

Notes: Wiring and connections by security provider.
Smoke Seal at Dr 220 only.

Set: 16.0

3	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Passage Set	8215 LNL	US32D	SA
1	Door Closer	7500 provide arm as required	689	NO
1	Wall Stop	406/409 to suit	US32D	RO
1	Gasketing - Smoke Seal	S88BL LAR		PE
1	Sweep	315CN x Width		PE

Set: 17.0

3	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Passage Set	8215 LNL	US32D	SA
1	Door Closer	7500 provide arm as required	689	NO
1	Wall Stop	406/409 to suit	US32D	RO
1	Gasketing - Smoke Seal	S88BL LAR		PE
1	Sweep	315CN x Width		PE

Set: 18.0

3	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Passage Set	8215 LNL	US32D	SA
1	Wall Stop	406/409 to suit	US32D	RO
3	Silencer - Metal Frame	608		RO

Set: 19.0

3	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Passage Set	8215 LNL	US32D	SA
1	Wall Stop	406/409 to suit	US32D	RO
3	Silencer - Metal Frame	608		RO

Set: 20.0

3	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Set	8265 LNL	US32D	SA
1	Wall Stop	406/409 to suit	US32D	RO
3	Silencer - Metal Frame	608		RO

Set: 21.0

3	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Privacy Set	8265 LNL	US32D	SA
1	Wall Stop	406/409 to suit	US32D	RO
3	Silencer - Metal Frame	608		RO

Set: 22.0

3	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Pull Plate - 4" x 16"	107x70C	US32D	RO
1	Push Plate - 4" x 16"	70C	US32D	RO
1	Door Closer	7500 provide arm as required	689	NO
1	Wall Stop	406/409 to suit	US32D	RO
1	Sweep	315CN x Width		PE
3	Silencer - Metal Frame	608		RO

Set: 23.0

3	BB Hinge	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Security Set	8238 LNL	US32D	SA
2	Removable Core	33N700006	26	MC
1	Wall Stop	406/409 to suit	US32D	RO
3	Silencer - Metal Frame	608		RO

Set: 24.0

1	Continuous Hinge (AL Doors)	CFM83SLIHD3 x Height Required	CL	PE
1	Exit Device	12 NB8715 ETL	US32D	SA
1	Concealed Overhead Stop	1-X36 size accordingly	630	RF
1	Door Closer	7500 provide arm as required	689	NO

Set: 24.1

1	Continuous Hinge (AL Doors)	CFM83SLIHD3 x Height Required	CL	PE
1	Exit Device	12 NB8715 ETL	US32D	SA
1	Concealed Overhead Stop	1-X36 size accordingly	630	RF
1	Door Closer	7500 provide arm as required	689	NO
1	Gasketing - Smoke Seal	S88BL LAR		PE

Set: 25.0

1	Continuous Hinge (AL, power trans)	CFM83SLI-HD3 EL-EPT-SC		PE
1	Exit Device	12 56 NB8715 ETL	US32D	SA
1	Concealed Overhead Stop	1-X36 size accordingly	630	RF
1	Door Operator	6020	689	NO
2	Actuator	505		NO

Set: 25.1

1	Continuous Hinge (AL, power trans)	CFM83SLI-HD3 EL-EPT-SC		PE
1	Exit Device	12 56 NB8715 ETL	US32D	SA
1	Concealed Overhead Stop	1-X36 size accordingly	630	RF
1	Door Operator	6020	689	NO

2	Actuator	505	NO
1	Gasketing - Smoke Seal	S88BL LAR	PE

Notes: Doors are always active by pushing or pulling on the doors. Also can be activated by pushing on the actuator to utilize the Auto Operator.

Set: 26.0

1	All hardware	by door manufacturer	00

END OF SECTION 087100

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SECTION 088100 – GLASS AND GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference in this Section:

a. Hollow metal doors
b. Wood Doors
c. FRP Doors
d. Aluminum Storefronts
e. Aluminum Windows

1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

C. Deterioration of Coated Glass: Defects developed from normal use attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

D. Deterioration of Laminated Glass: Defects developed from normal use attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

E. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 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 the following: 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. Glass Design: Glass thicknesses indicated on the Drawings are for detailing only. Design glass to comply with ASTM E 1300 and International Building Code (IBC) according to the following requirements:

1. Design Wind Pressures: As indicated on Structural Drawings.
2. Design Snow Loads: As indicated on Structural Drawings.
3. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
4. Maximum Lateral Deflection: 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, whichever is less.
5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 1/4 inch thick.
2. For insulating-glass units, properties are based on units with lites 1/4 inch thick and a nominal 1/2- inch- wide interspace.
3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:

a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.
b. Solar Heat Gain Coefficient: NFRC 200.
c. Solar Optical Properties: NFRC 300.

1.5 APPLICABLE STANDARDS

A. Safety Glazing: Conform to Safety Standard for Architectural Glazing Materials (16 CFR 1201). Tempered glass and wire glass shall conform to requirements of ANSI Z97.1, with permanent label in accordance with statutes.

B. Insulating Glass: ASTM E773, Seal Durability of Sealed Insulating Glass Units and ASTM E774, Sealed Insulating Glass Units. Certification through Insulating Glass Certification Council, Class A level.

C. Flat Glass: ASTM C1036, Flat Glass. Flat Glass Marketing Association (FGMA) Glazing Manual.

D. Fire-Resistance-Rated Wire Glass: Provide wire glass products that are identical to those tested per ASTM E163 (UL 9) and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

E. Heat Treated Flat Glass: ASTM C1048, Heat Treated Flat Glass.

1.6 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: Provide for structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Shop Drawings: Review curtain wall and window shop drawings and submit acceptance of details as suitable for proposed glass products.

D. Glass Samples: For each type of the following products; 12 inches square.

1. Coated glass.
2. Fire-resistive ceramic glazing products.
3. Insulating glass.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on the Drawings.

F. Qualification Data: For Installer.

G. Product Certificates: For glass and glazing products, from manufacturer.

H. Preconstruction adhesion and compatibility test report.

I. Warranties: Samples of special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

1.8 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. FGMA Publication: "FGMA Glazing Manual."
2. LSGA Publication: "LSGA Design Guide."
3. SIGMA Publication: TM-3000 "Vertical Glazing Guidelines".

4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
5. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."

B. Safety Glazing Labeling: Where safety-glazing labeling 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. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

E. Manufacturer Qualifications for Insulating-Glass Units with Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

F. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

G. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:

1. Primary glass of each (ASTM C 1036) type and class indicated.
2. Heat-treated glass of each (ASTM C 1048) condition indicated.
3. Insulating glass of each construction indicated.

H. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method indicated.

I. 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.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's printed instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing materials 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 below 40 deg.

1.11 WARRANTIES

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated- glass 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 printed instructions. Defects include peeling, cracking, and other indications of deterioration in coating, includes replacement of failed units.

1. Warranty Period: Ten (10) years from Date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which 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 printed instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass, includes replacement of failed units.

1. Warranty Period: Ten (10) years from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 1/4 inch.

2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

B. Strength: Where float glass is indicated, provide, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. 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 1/4 inch thick.
2. For laminated glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to following:

1. Guardian Industries Corp.
2. Interpane Glass Company
3. Pilkington North America, Inc.
4. PPG Industries, Inc.
5. Viracon, Inc.

B. Glass Products: Subject to compliance with the requirements, provide glass products specified in the Glazing Schedule at end of Part 3 of this Section.

2.3 GLASS PRODUCTS

A. Clear Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.

1. Kind HS (heat-strengthened) where recommended by the manufacturer.
2. Kind FT (fully-tempered) where Safety Glass is indicated or, if not indicated, required by governing building code.
3. For uncoated glass, comply with requirements for Condition A.
4. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

B. Tinted Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class 2 (tinted) unless otherwise indicated; of kind and condition indicated.

1. Kind HS (heat-strengthened) where recommended by the manufacturer.
2. Kind FT (fully-tempered) where Safety Glass is indicated or, if not indicated, required by governing building code.
3. For uncoated glass, comply with requirements for Condition A.
4. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.4 INSULATING GLASS UNITS

A. Sealed Insulating Glass Units: Factory-assembled units consisting of organically sealed lites of glass separated by dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.

1. Classification of Units: Class CB or CBA.
2. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
3. Spacer: Aluminum with black color anodic finish.
4. Desiccant: Molecular sieve or silica gel, or blend of both.

B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating Glass Units" Article.

2.5 FIRE-PROTECTION-RATED GLAZING MATERIAL

A. Fire-Protection-Rated Glazing Material, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

B. Monolithic Ceramic Glazing: Clear, ceramic flat glass; 3/16-inch nominal thickness.

1. Products: Subject to compliance with requirements, provide one of the following meeting the requirements of the Basis-of-Design Product:

    a. Nippon Electric Glass Co., Ltd
    b. Safti First.
    c. Schott North America, Inc.
    d. Vetrotech Saint-Gobain; SGG Keralite FR-F, Basis-of-Design Product.

C. Laminated Ceramic Glazing Material: Laminated glazing made up of two plies of transparent ceramic glazing material; 5/16-inch total nominal thickness; polished on both surfaces; weighing 4 lb./sq.ft.; and complying with testing requirements in 16 CFR 1201 for Category II materials.

1. Products: Subject to compliance with requirements, provide one of the following meeting the requirements of product scheduled at end of Part 3 of this Section:

    a. Nippon Electric Glass Co., Ltd

b. Schott North America, Inc.
c. Vetrotech Saint-Gobain; SGG Keralite FR-F, Basis-of-Design Product

2.6 PREFORMED GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded black gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C 864.
2. EPDM complying with ASTM C 864.
3. Silicone complying with ASTM C 1115.
4. Thermoplastic polyolefin rubber complying with ASTM C 1115.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene, EPDM, silicone, or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.

1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

D. Manufacturers: Subject to compliance with requirements, provide preformed glazing gasket products by one of the following manufacturers:

1. Advanced Elastomer Systems, L.P.
2. Schnee-Morehead, Inc.
3. Tremco, Inc.

2.7 GLAZING SEALANTS

A. General:

1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' printed instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Dow Corning Corporation; 790.
    b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
    c. May National Associates, Inc.; Bondaflex Sil 290.
    d. Pecora Corporation; 890.
    e. Sika Corporation, Construction Products Division; SikaSil-C990.
    f. Tremco Incorporated; Spectrem 1.

2. Applications: Exterior glazing unless indicated otherwise.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of 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. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

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 printed instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

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 will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined printed instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. 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.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches.

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 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.

H. 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 according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 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 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 by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.5 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.

3.6 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's printed instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.7 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four (4) 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

A. General: Provide types of glazing products manufactured from glazing components specified in Part 2 of this Section, for locations shown on the Drawings and according to the following Glazing Schedule.

B. Safety Glazing Requirements: Fully-tempered safety glass location requirements are not specifically addressed on the Drawings or in the glazing Schedule below, and are the responsibility of glass manufacturer and glazing Installer. Comply with applicable safety glazing requirements in 2009 International Building Code - Section 2406 ‘Safety Glazing’ and in Subsection 2406.4 ‘Specific Hazardous Locations’ including, but not limited to Paragraph Numbers 1, 6, 7 10, and 11.

C. GL-1: Insulated, Clear

1. Low-E-Coated Insulating Glass: exterior silicone cap bead, 1" insulating glass, interior EPDM drive-in wedge or Santoprene™ bulb gasket threaded into aluminum glazing beads; glazed by the window manufacturer:
2. Exterior Insulating Glass Unit: Cardinal LoE-270, Solarban 60, Viracon or equivalent by other manufacturer.

a. Materials

1) Spacer: polymer-coated stainless steel.
2) Spacer color: light gray.
3) Primary seal: polyisobutylene.
4) Secondary seal: silicone.
5) Airspace fill: argon.

b. Exterior Glass Lite:

1) Thickness: 1/4".
2) Tint: clear.
3) Type: annealed.
4) Coating: Soft coat low E on #2 surface.

c. Interior Glass Lite:

1) Thickness: 1/4".
2) Tint: clear.
3) Type: annealed.

3. Warranty: Provide manufacturer's standard 10 year product warranty on maintained hermetic seal.

D. GL-2: Insulating Clear, Tempered

1. Tempered Low-E-Coated Insulating Glass: exterior silicone cap bead, 1" insulating glass, interior EPDM drive-in wedge or Santoprene™ bulb gasket threaded into aluminum glazing beads; glazed by the window manufacturer:
2. Exterior Insulating Glass Unit: Cardinal LoE-270, Solarban 60, Viracon or equivalent by other manufacturer.

a. Materials

1) Spacer: polymer-coated stainless steel.
2) Spacer color: light gray.
3) Primary seal: polyisobutylene.
4) Secondary seal: silicone.
5) Airspace fill: argon.

b. Exterior Glass Lite:

1) Thickness: 1/4".
2) Tint: clear.
3) Type: tempered
4) Coating: Soft coat low E on #2 surface.

c. Interior Glass Lite:

1) Thickness: 1/4".
2) Tint: clear.

3) Type: tempered

3. Warranty: Provide manufacturer's standard 10 year product warranty on maintained hermetic seal.

E. GL-3: Insulated, Light Diffusing

1. Light Diffusing Low-E-Coated Insulating Glass: exterior silicone cap bead, 1" insulating glass, interior EPDM drive-in wedge or Santoprene™ bulb gasket threaded into aluminum glazing beads; glazed by the window manufacturer:
2. Exterior Insulating Glass Unit: Solera L R2.2 Glass with Cardinal LoE-270, Solarban 60, Viracon or equivalent by other manufacturer.

a. Materials

1) Spacer: polymer-coated stainless steel.
2) Spacer color: light gray.
3) Primary seal: polyisobutylene.
4) Secondary seal: silicone.
5) Airspace fill: argon.

b. Exterior Glass Lite:Solera

1) Thickness: 1/4".
2) Tint: white
3) Type: tempered
4) Coating: Soft coat low E on #2 surface.

c. Interior Glass Lite:

1) Thickness: 1/4".
2) Tint: white
3) Type: tempered

3. Warranty: Provide manufacturer's standard 10 year product warranty on maintained hermetic seal.

F. GL-4: Float, Cear

1. ¼" Clear Glass

G. GL-5: 1-Hour Fire-Rated Glass, Tempered

1. 1-Hour Fire Rated ¼" Tempered Clear Glass

H. GL-6:

1. 1-Hour Fire Rated ¼" Clear Glass

END OF SECTION 088100

SECTION 092900 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior gypsum wallboard.
2. Exterior gypsum board panels for ceilings and soffits.
3. Tile backing panels.
4. Non-load-bearing steel framing.

1.3 ACTION SUBMITTALS

A. Product Data: For each product indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

PART 2 - PRODUCTS

2.1 STEEL FRAMING

A. Steel Framing, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Metal complying with ASTM C 645 requirements.

a. Protective Coating:

1) Interior Applications: manufacturer's standard corrosion-resistant zinc coating.
2) Exterior Applications: ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.

B. Suspended Ceiling and Soffit Framing:

1. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch- diameter wire.
2. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
3. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 1.36 mm (0.0538 inch), a minimum 13 mm (1/2-inch-) wide flange, and in depth indicated.
4. Furring Channels (Furring Members):

    a. Cold Rolled Channels: 1.36 mm (0.0538-inch) bare steel thickness, with minimum 13 mm (1/2-inch-) wide flange, 19 mm (3/4 inch) deep.
    b. Steel Studs: ASTM C 645, in depth indicated.

        1) Minimum Base Metal Thickness: .79mm (0.0312 inch).

    c. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 22 mm (7/8 inch) deep.

        1) Minimum Base Metal Thickness: .79mm (0.0312 inch).

C. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Manufacturers and Products:

    a. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

        1) Armstrong World Industries, Inc.; Furring Systems/Drywall.
        2) Chicago Metallic Corporation; Fire Front 630, Drywall Furring 640, Fire Front 650, Drywall Furring 660, or Fire Front 670 System.
        3) USG Interiors, Inc.; Drywall Suspension System.

D. Partition and Soffit Framing:

1. Steel Studs and Runners: ASTM C 645, in depth indicated.

    a. Minimum Base Metal Thickness: .685 mm (0.027 inch).

2. Deep-Leg Deflection Track: ASTM C 645 top runner with 51 mm (2-inch-) deep flanges.
3. Proprietary Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.

4. Manufacturers and Products:

    a. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

1) Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
2) Metal-Lite, Inc.; Slotted Track.

5. Proprietary Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

   a. Products:

      1) Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
      2) Metal-Lite, Inc.; The System.

6. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

   a. Minimum Base Metal Thickness: .685 mm (0.027 inch).

7. Cold-Rolled Channel Bridging: 1.36 mm (0.0538-inch) bare steel thickness, with minimum 1/2-inch- wide flange, and in depth indicated.

   a. Clip Angle: 38 mm by 38 mm (1-1/2 by 1-1/2 inch), 1.72 mm (0.068-inch) thick, galvanized steel.

8. Hat-Shaped, Rigid Furring Channels: ASTM C 645, in depth indicated.

   a. Minimum Base Metal Thickness: 1.36 mm (0.0312 inch).

9. Resilient Furring Channels: 13 mm (1/2-inch-) deep, steel sheet members designed to reduce sound transmission. Asymmetrical or hat shaped, with face attached to single flange by a slotted leg (web) or attached to two flanges by slotted or expanded metal legs.
10. Cold-Rolled Furring Channels: 1.36 mm (0.0538-inch) bare steel thickness, with minimum 13 mm (1/2-inch-) wide flange, and in depth indicated.

    a. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 1.36 mm (0.0312 inch).
    b. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 1.58 mm (0.0625-inch-) diameter wire, or double strand of 1.2 mm (0.0475-inch-) diameter wire.

11. Z-Shaped Furring: With slotted or nonslotted web, face flange of 32 mm (1-1/4 inches), wall attachment flange of 22 mm (7/8 inch), minimum bare metal thickness of .45 mm (0.0179 inch), and depth required to fit insulation thickness indicated.
12. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.2 PANEL PRODUCTS

A. Panel Size, General: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Regular Type: In thickness indicated and with long edges tapered and featured (rounded or beveled).
2. Type X: In thickness indicated and with long edges tapered and featured (rounded or beveled).

C. Flexible Gypsum Wallboard: ASTM C 36, manufactured to bend to fit tight radii and to be more flexible than standard regular-type panels of the same thickness, 6 mm (1/4 inch) thick, and with long edges tapered. Apply in double layer at curved assemblies.

D. Sag-Resistant Gypsum Wallboard: ASTM C 36, manufactured to have more sag resistance than regular-type gypsum board, 13mm (1/2 inch) thick, and with long edges tapered. Apply on ceiling surfaces.

E. Proprietary, Special Fire-Resistive Type: ASTM C 36, having improved fire resistance over standard Type X, complying with requirements of fire-resistance-rated assemblies indicated, in thickness indicated, and with long edges tapered and featured (rounded or beveled) for prefilling.

F. Foil-Backed Gypsum Wallboard: ASTM C 36, with core type and in thickness indicated, and with long edges tapered and featured (rounded or beveled) for prefilling.

G. Proprietary Abuse-Resistant Gypsum Wallboard: ASTM C 36, manufactured to produce greater resistance to surface indentation and through-penetration than standard gypsum panels, with core type and in thickness indicated, and with long edges tapered.

1. Manufacturers and Products:

a. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

1) National Gypsum Company; Gold Bond Hi-Abuse Wallboard.
2) United States Gypsum Co.; SHEETROCK Brand Abuse-Resistant Gypsum Panels.

H. Exterior Gypsum Panels for Ceilings and Soffits:

1. Exterior Gypsum Soffit Board: ASTM C 931/C 931M, with core type and in thickness indicated and with manufacturer's standard edges.
2. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with core type and in thickness indicated.

3. Manufacturers:

a. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

1) Product: G-P Gypsum Corp; Dens-Glass Gold.

I. Tile Backing Panels:

1. Cementitious Backer Units: ANSI A118.9, in thickness indicated.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Bullnose Bead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. Curved-Edge Cornerbead: With notched or flexible flanges; use at curved openings.

B. Exterior Trim: ASTM C 1047, hot-dip galvanized steel sheet or rolled zinc.

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers:

a. Subject to compliance with requirements, available products from the following manufacturers that may be incorporated into the Work include, but are not limited to following:

1) Fry Reglet Corp.
2) Gordon, Inc.
3) MM Systems Corporation.
4) Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, alloy 6063-T5.
3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: 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, flanges of trim accessories, and fasteners, use drying-type, all-purpose compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping and setting-type, sandable topping compounds.
2. Glass-Mat Gypsum Sheathing Board: As recommended by manufacturer.

E. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping and setting-type, sandable topping compounds.
2. Glass-Mat, Water-Resistant Backing Panel: As recommended by manufacturer.
3. Cementitious Backer Units: As recommended by manufacturer.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant, complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Manufacturers and Products:

    a. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

        1) Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
        2) United States Gypsum Co.; SHEETROCK Acoustical Sealant.

C. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Manufacturers and Products:

    a. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

1) Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
2) Pecora Corp.; BA-98.
3) Tremco, Inc.; Tremco Acoustical Sealant.

D. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from .84 to 2.84 mm (0.033 to 0.112 inch) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

E. Isolation Strip at Exterior Walls:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 3 mm (1/8 inch) thick, in width to suit steel stud size.

F. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

2.6 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indices of not more than 25 when tested according to ASTM E 84.

1. Manufacturers and Products:

a. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

1) G-P Gypsum Corp.; GyProc Ceiling Texture/Polystyrene.
2) National Gypsum Company; Gold Bond Perfect Spray.
3) United States Gypsum Co.; SHEETROCK Ceiling Spray Texture, QT Polystyrene.

2. Texture: Fine.

PART 3 - EXECUTION

3.1 NON-LOAD-BEARING STEEL FRAMING INSTALLATION

A. General: Comply with ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Suspended Ceiling and Soffit Framing:

1. Suspend ceiling hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Attach hangers to structural members. Do not support ceilings from or attach hangers to permanent metal forms, steel deck tabs, steel roof decks, ducts, pipes, or conduit.
4. Screw furring to wood framing.
5. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.
6. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

C. Partition and Soffit Framing:

1. Where studs are installed directly against exterior walls, install isolation strip between studs and wall.
2. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
3. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb, unless otherwise indicated.
    b. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

4. 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.

D. Z-Furring Members: Erect insulation vertically and hold in place with Z-furring members.

1. Until gypsum board is installed, hold insulation in place with 10-inch staples fabricated from 0.0625-inch- diameter, tie wire and inserted through slot in web of member.

E. Polyethylene Vapor Retarder: Install to comply with requirements specified in Division 7 Section "Building Insulation."

3.2 PANEL PRODUCT INSTALLATION

A. Gypsum Board: Comply with ASTM C 840 and GA-216.

1. Space screws a maximum of 305 mm (12 inches) o.c. for vertical applications.
2. Space fasteners in panels that are tile substrates a maximum of 203 mm (8 inches) o.c.
3. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
4. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of board.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

5. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
6. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
7. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.
8. Laminating to Substrate: Comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

B. Exterior Ceilings and Soffits: Apply exterior gypsum panels perpendicular to supports, with end joints staggered and located over supports.

1. Fasten with corrosion-resistant screws.

C. Tile Backing Panels:

1. Cementitious Backer Unit Application: ANSI A108.11.

3.3 FINISHING

A. Installing Trim Accessories: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Finishing Gypsum Board Panels: 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.

1. Prefill open joints, rounded or beveled edges, and damaged surface areas.
2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
3. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
4. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

C. Cementitious Backer Units: Finish according to manufacturer's written instructions.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated panels are substrate for acoustical tile.
3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

3.4 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture finish manufacturer's written recommendations.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Ceramic floor tile.
2. Ceramic wall tile.
3. Grout.
4. Metal edge strips.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

A. Manufacturers and Products:

1. See Architectural Finishes Schedule:

2.2 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. All door thresholds: Schluter-RENO-U clear anodized aluminum floor transition.

2.3 SETTING MATERIALS

A. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.

1. Manufacturers: See Architectural Finishes Schedule:
2. For wall applications, provide nonsagging mortar.

2.4 GROUT MATERIALS

A. Manufacturers and Products:

1. See Architectural Finishes Schedule

2.5 MISCELLANEOUS MATERIALS

A. Metal Edge Strips: All outside corners:

1. Manufacturers:

   a. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

      1) Schluter-RONDEC clear anodized corner bead.

B. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

C. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in

items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

E. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.

F. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor & Base Installations, Concrete Subfloor:

1. Tile Installation F113: Thin-set mortar; TCA F113.

   a. Thin-Set Mortar: Dry-set portland cement mortar.
   b. Grout: Polymer-modified unsanded Water-cleanable epoxy grout.

END OF SECTION 093000

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SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

1.2 SUMMARY

A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated including physical characteristics and performance criteria.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: Provide manufacturer's requirement for maintenance of washable acoustical ceiling panels with submission of O&M manuals.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS FOR OFFICE TYPE AREAS

A. Manufacturer and Product:

1. See Architectural Finish Schedule

2.2 ACOUSTICAL PANELS FOR WASHABLE SURFACES (TOILET ROOMS, ETC.)

A. Manufacturer and Product:

1. See Architectural Finish Schedule

2.3 CEILING SUSPENSION SYSTEM

A. Manufacturer and Product:

1. See Architectural Finish Schedule for each type.

B. Attachment Devices: Sized for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.

C. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.

1. Size: Provide yield strength at least 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung), but not less than 2.69-mm- (0.106-inch-) diameter wire.

D. Hold-Down Clips: Manufacturer's standard product; spaced 610 mm (24 inches) o.c. on all cross tees.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Measure each ceiling area and center panels in space.

C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with location of hangers, use trapezes or equivalent devices. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.

1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
2. Do not attach hangers to steel deck tabs or to steel roof deck.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate at intervals not more than 406 mm (16 inches) o.c. and not more than 76 mm (3 inches) from ends, leveling with ceiling suspension system to a tolerance of 3 mm (1/8 inch) in 3658 mm (12 feet). Miter corners accurately and connect securely.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. 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 a neat, precise fit.

END OF SECTION 095113

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Resilient wall base.

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated.

C. Samples: For each type of product indicated, in manufacturer's standard-size.

1.4 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer in spaces to receive resilient products.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:

1. Manufacturer and Product:

a. See Architectural Finishes Schedule

B. Resilient Base Standard: ASTM F 1861.

1. Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
2. Style: Cove (base with toe).

C. Minimum Thickness: 3 mm (0.125 inch).

D. Height: 102 mm (4 inches).

E. Lengths: Cut lengths 1219 mm (48 inches) long or coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Colors and Patterns: As indicated in the Architectural Finishes Schedule.

2.2 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Do not install resilient products until they are same temperature as the space where they are to be installed.

3.2 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 practicable 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.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes luxury vinyl floor tile.

1.3 ACTION SUBMITTALS

A. Provide action submittals for all items in this specification section for review within a single submittal to the Government.

B. Product Data: For each type of product.

C. Samples: Units not less than 150-by-150 mm (6-by-6 inch) of each color and pattern of floor tile required.

D. Qualification Data for Installer: Signed by resilient sheet flooring manufacturer certifying the party listed complies with requirements specified in “Quality Assurance” article.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: provide manufacturer’s requirement for maintenance of resilient sheet flooring with submission of O&M manuals.

B. Warranty: Provide manufacturer’s standard warranty for requirements listed in “Warranty” article of this section for carpeting with submission of O&M manuals.

1.5 QUALITY ASSURANCE

A. Manufacturer: Provide resilient flooring manufactured by a firm with a minimum of 10 years’ experience with resilient flooring of types specified.

1. Color Matching: Provide resilient flooring products, including wall base and accessories, from one manufacturer to ensure color matching.
2. Manufacturer capable of providing technical training and field service representation.

B. Installation Qualifications: Installer shall be nora approved for the requirements of the project or INSTALL (International Standards & Training Alliance) resilient certified for the requirements of the project.

C. Product Data: For each type of product.

D. Samples: Units not less than 150-by-150 mm (6-by-6 inch) of each color and pattern of floor tile required.

E. Qualification Data for the Installer: Signed by resilient sheet flooring manufacturer certifying the party listed complies with requirements specified in “Quality Assurance” article.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Provide manufacturer’s requirement for maintenance of resilient sheet flooring with submission of O&M manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer: Provide resilient flooring manufactured by a firm with a minimum of 10 years’ experience with resilient flooring of types specified.

1. Color Matching: Provide resilient flooring products, including wall base and accessories, from one manufacturer to ensure color matching.
2. Manufacturer capable of providing technical training and field service representation.

B. Installer Qualifications: Installer shall be manufacturer approved for the requirements of the project.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.

B. Deliver materials sufficiently in advance of installation to condition materials to the required temperature prior to installation.

1.9 PROJECT CONDITIONS

A. Maintain temperature and humidity at service levels or 20° C (68° F), ± 3° C (5° F), and 50% RH ± 10% in areas to receive resilient flooring. Specified temperature shall be maintained at least 48 hours before, during, and 72 hours after installation.

PART 2 - PRODUCTS

2.1 LUXURY VINYL TILE FOR COMMERCIAL TRAFFIC

A. Manufacturer and Products: (No Substitution):

1. See Architectural Finishes Schedule.

2.2 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.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

    a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate required by the resilient floor manufacturer in a 24 hour time period.
    b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level percentage required by the resilient floor manufacturer.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 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 square with room axis.

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 with grain running in one direction.

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.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 099113 – EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Concrete.
2. Steel.
3. Galvanized metal.
4. Wood.

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 200 mm (8 inches) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current “MPI Approved Products List” for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in “MPI Approved Products List.”
2. Preparation and Workmanship: Comply with requirements in “MPI Architectural Painting Specification Manual” for products and paint systems indicated.

1.5 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 7 deg C (45 deg F).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 10 and 35 deg C (50 and 95 deg F).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 3 deg C (5 deg F) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 3.8 L (1 gal.) of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers' products that may be incorporated into the Work include, but are not limited to the following:

1. Hallman Lindsay
2. Sherwin-Williams Company (The)
3. Benjamin Moore & Co.

2.2 PAINT, 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 manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: See Architectural Finish Schedule

2.3 PRIMERS/SEALERS

A. Alkali-Resistant Primer: MPI #3.

1. VOC Content: E Range of E1.

B. Bonding Primer (Solvent Based): MPI #69.

1. VOC Content: E Range of E1.

C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint system indicated.

2.4 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E1.

B. Quick-Drying Alkyd Metal Primer: MPI #76.

1. VOC Content: E Range of E1.

2.5 WOOD PRIMERS

A. Exterior Alkyd Wood Primer: MPI #5.

1. VOC Content: E Range of E2.

B. Exterior Oil Wood Primer: MPI #7.

1. VOC Content: E Range of E2.

2.6 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Flat): MPI #8 (Gloss Level 1).

1. VOC Content: E Range of E1.

B. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).

1. VOC Content: E Range of E1.

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 work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates 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 plates, machined surfaces, and similar items already in place that 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.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible printers and reprime substrate with compatible primers 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. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

G. 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.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

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.

B. Tint each undercoat a lighter shad to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

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.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Government reserves the right to invoke the following procedure at any time and as often as Government deems necessary during the period when paints are being applied:

1. Government will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance of paint materials with product requirements.
3. Government may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

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 Contracting Officer's Representative, 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. Concrete Substrates

1. Clear Sealer System: MPI EXT 3.2G.

    a. Prime Coat: Interior/exterior clear concrete floor sealer (solvent based).
    b. Intermediate Coat: Interior/exterior clear concrete floor sealer (solvent based).
    c. Topcoat: Interior/exterior clear concrete floor sealer (solvent based).

B. Steel Substrates:

1. Alkyd System: MPI EXT 5.1D.

    a. Prime Coat: Alkyd anticorrosive metal primer.
    b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    c. Topcoat: Exterior alkyd enamel (semigloss).

C. Galvanized-Metal Substrates:

1. Alkyd System: MPI EXT 5.3B.

    a. Prime Coat: Cementitious galvanized-metal primer.
    b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    c. Topcoat: Exterior alkyd enamel (semigloss).

D. Dressed Lumber Substrates: Including architectural woodwork, doors.

1. Alkyd System: MPI EXT 6.3B.

    a. Prime Coat: Exterior alkyd wood primer.
    b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    c. Topcoat: Exterior alkyd enamel (semigloss).

END OF SECTION 099113

SECTION 099123 – INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and application of paint systems on the following interior substrates:

1. Steel
2. Galvanized metal
3. Wood and PVC foam (Fypon).
4. Gypsum board

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 200 mm (8 inches) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application.

D. Product List: For each product indicated, including the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicted on Drawings and in schedules.
2. Printout of current “MPI” Approved Products List” for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in “MPI Approved Products List.”
2. Preparation and Workmanship: Comply with requirements in “MPI Architectural Painting Specification Manual” for products and paint systems indicated.

1.5 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.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 10 and 35 deg C (50 and 95 deg F).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 3 deg C (5 deg F) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 3.8 L (1 gal) of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers' products that may be incorporated into the Work include, but are not limited to the following:

1. Hallman Lindsay
2. Sherwin Williams Company (The)
3. Benjamin Moore & Co.

2.2 PAINT, 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 manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: See Architectural Finish Schedule.

2.3 BLOCK FILLERS

A. Interior/Exterior Latex Block Filler: MPI #4.

1. VOC Content: E Range of E2.

2.4 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

1. VOC Content: E Range of E2.

B. Interior Alkyd Primer/Sealer: MPI #45.

1. VOC Content: E Range E2.

C. Interior Low Permeability Latex Primer/Sealer: MPI #61. (Vapor Barrier)

1. VOC Content: E Range E2.

D. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.5 METAL PRIMERS

A. Alkyd Anticorrosive Metal Primer: MPI #79.

1. VOC Content: E Range of E2.

2.6 WOOD AND PVC FOAM PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39.

1. VOC Content: E Range of E2.

2.7 LATEX PAINTS

A. Interior Latex (Eggshell): MPI #52 (Gloss Level 3).

1. VOC Content: E Range of E2.

B. Interior Latex (Satin): MPI #43 (Gloss Level 4).

1. VOC Content: E Range of E2.

2.8 SOLVENT BASED EPOXY COATING

A. Solvent Based Epoxy: MPI #108

2.9 ALKYD PAINTS

A. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).

1. VOC Content: E Range of E2.

2.10 ALIPHATIC COATING

A. Aliphatic Finish Glaze Coat: MPI #174.

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 work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Wood: 15 percent.
2. Gypsum Board: 12 percent.
3. Plaster: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that 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.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

F. Wood and PVC Foam 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.

G. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

H. Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Pain surfaces behind moveable 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 from and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

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. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1. Mechanical Work:

a. Uninsulated metal piping.
b. Uninsulated plastic piping.
c. Pipe hangers and supports.
d. Tanks that do not have factory-applied final finishes.
e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:

a. Switchgear.
b. Panelboards.
c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Government reserves the right to invoke the following procedures at any time and as often as Government deems necessary during the period when paints are being applied:

1. Government will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with product requirements.
3. Government may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At the 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 Contracting Officer's Representative, and leave in an undamaged condition.

D. At completion of construction activities or other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Institutional Low-Odor/VOC Latex System: MPI INT 3.1M.

    a. Prime Coat: Institutional low-odor/VOC interior latex matching topcoat.
    b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
    c. Topcoat: Institutional low-odor/VOC interior latex (eggshell).

B. CMU Substrates:

1. Institutional Low-Odor/VOC Latex System: MPI INT 4.2E.

    a. Prime Coat: Interior/exterior latex block filler.
    b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
    c. Topcoat: Institutional low-odor/VOC interior latex (eggshell).

C. Steel Substrates:

1. Prime Coat: Alkyd anticorrosive metal primer.
2. Intermediate Coat: Interior alkyd matching topcoat.
3. Topcoat: Interior alkyd semigloss.

D. Galvanized-Metal Substrates:

1. Prime Coat: Cementitious galvanized-metal primer.

a. Prime Coat: Cementitious galvanized-metal primer.
b. Intermediate Coat: Interior alkyd matching topcoat.
c. Topcoat: Interior alkyd semigloss.

E. Dressed Lumber and PVC Foam Substrates: Including architectural woodwork, doors and wall base.

1. Alkyd System: MPI INT 6.3B.

a. Prime Coat: Interior alkyd primer/sealer.
b. Intermediate Coat: Interior alkyd semigloss.
c. Topcoat: Interior alkyd semigloss.

F. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M.

a. Prime Coat: Interior latex primer/sealer.
b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
c. Topcoat: Institutional low-odor/VOC interior latex (eggshell).

2. Liquid Glaze System

a. General: Contractor shall submit a coating system. These specialty systems are not typically classified by the MPI system. Government requirement states, “Seamless, sprayed-on, lusterless semi-gloss two-component polyester epoxy or polyurethane finish.”
b. Prime Coat: Interior latex primer/sealer, compatible with solvent based Epoxy Intermediate Coat.
c. Intermediate Coat: Solvent Based Epoxy
d. Topcoat: Aliphatic Finish Glaze Coat

END OF SECTION 099123

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SECTION 101100 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wall-mounted dry erase magnetic boards.

1.2 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product.

C. Shop Drawings: For visual display units

1. Include plans, elevations, sections, details, and attachment to other work.

1.3 CLOSEOUT SUMBITTALS

A. Maintenance Data: For magnetic marker board surface to include in maintenance manuals.

B. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display boards, including factory-applied trim where indicated, completely assembled. Store visual display units vertically with packing materials between each unit.

1.5 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer and Product: Basis-of Design Manufacturer and Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Marsh Industries, Inc. – Model PR-408-1460

2.2 MAGNETIC MARKER BOARD ASSEMBLIES

A. Size: 4’ x 8’ - seamless construction

B. Marker board color: White

C. Marker board surface: Magnetic porcelain enameled steel

D. Frame and trim: Factory applied satin finish aluminum

2.3 ACCESSORIES

A. Chalktray - Markerboard: Manufacturer's standard, continuous.

1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

B. Map Rail - Markerboard and Bulletin boards: Provide the following accessories:

1. Display Rail: Continuous and integral with map rail; fabricated from cork approximately 1 to 2 inches (25 to 50 mm) wide.
2. End Stops: Located at each end of map rail.
3. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches (1220 mm) 1200 mm of map rail or fraction thereof.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance.

B. Examine walls and partitions for proper backing for visual display surfaces.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove dirt, scaling paint, projections, and depressions that will affect smooth, finished surfaces of visual display boards.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

1. Mounting Height: 36 inches (914 mm) above finished floor to top of chalktray unless noted otherwise.

3.4 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 101100

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SECTION 101400 – INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior Building Signage

1.3 DEFINITIONS

A. Retain this Article if term in paragraph below remains after this Section has been edited.

B. ABA Accessibility Guidelines: Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Literature and Product Data: For each type of product indicated.

C. Shop Drawings: Show fabrication and installation details for signs that comply with requirements on Drawings.

1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.

D. Color Charts for Selection: Manufacturer's finish charts showing full range of standard colors and textures available for units with factory-applied finishes for selection by Architect.

E. Sign Schedule: Use same designations indicated on Drawings.

1.5 CLOSEOUT SUBMITTALS

A. Warranties: Provide manufacturer and installer warranties with requirements specified in “Warranties” article with submission of O&M manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

B. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines

1.7 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Deterioration of embedded graphic image colors and sign lamination.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INTERIOR BUILDING SIGNAGE

A. Products:

1. Reference the architectural drawings pertaining to interior building signage.

B. Material: Colored opaque acrylic sheet, matt finish.

C. Sign and Frame Profiles: As indicated on the drawings.

D. Graphic Content and Style: Provide sign copy that complies with requirements indicated on drawings for size, style, spacing, mounting height and location, material, finishes, and colors of signage.

E. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of slide-in inserts.

F. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ABA Accessibility Guidelines. Text shall be accompanied by Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.

G. Mounting Height: As indicated on the drawings.

2.2 ACCESSORIES

A. Mounting Methods: Use silicone adhesive fabricated from materials that are not corrosive to sign material and mounting surface.

2.3 FINISHES, GENERAL

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.

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 work.

B. Verify that items, including anchor inserts, are sized and located to accommodate signs.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 75 mm (3 inches) of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.

1. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
2. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Government.

END OF SECTION 101400

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SECTION 101419 – DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior wall-mounted cast dimensional characters for building identification.

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product.

C. Shop Drawings: For dimensional letter signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.

D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of typestyles and graphic symbols designations specified, indicated on Drawings, or in a sign schedule.

E. Qualification Data: For Installer and manufacturer.

F. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include with submission of O&M manuals.

B. Warranties: Provide manufacturer warranties with requirements specified in "Warranties" article with submission of O&M manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Deterioration of finishes beyond normal weathering.
b. Separation or delamination of sheet materials and components.

B. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL LETTER SIGNS, GENERAL

A. Regional Materials: Dimensional letter signs shall be manufactured within 500 miles of Project site.

2.2 PERFORMANCE REQUIREMENTS

A. Thermal Movements: For exterior fabricated channel dimensional characters, allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 DIMENSIONAL CHARACTERS

A. Cutout Characters: Characters with uniform faces; square-cut, smooth edges; precisely formed lines and profiles; and as follows:

1. Character Material: Sheet or plate aluminum.
2. Character Height: As indicated.
3. Thickness: As indicated or manufacturer's standard for size of character.
4. Finishes:

a. Integral Aluminum Finish: Clear anodized.
b. Overcoat: Clear organic coating.

5. Mounting: Projecting studs.

2.4 DIMENSIONAL CHARACTER MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Sign Mounting Fasteners:

a. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

2.6 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability and for securing fasteners.
6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.7 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class II, 0.010 mm or thicker.

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 signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

   a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
   b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 102113 – HDPE PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the Solicitation and Division 00 and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid HDPE plastic toilet compartments, ceiling hung
2. Solid HDPE plastic urinal screens, wall mounted.

1.3 REFERENCES

A. International Code Council (ICC): International Building Code (www.iccsafe.com).

B. Americans with Disabilities Act (ADA).

1.4 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.

B. Shop Drawings: Submit shop drawings for fabrication and erection of toilet partition assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.

C. Color Charts for Selection: Manufacturer's finish charts showing full range of standard colors and textures available for units with factory-applied finishes for selection by Architect.

D. Sample special of warranty.

1.5 CLOSEOUT SUBMITTALS

A. Warranties: Completed manufacturer’s special warranty as described in the “Warranties” Article of this specification section.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

1.7 WARRANTY

A. Provide manufacturer's 15 year special warranty providing coverage against breakage, corrosion and delamination of solid plastic panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, available manufacturers and products that may be incorporated into the Work include, but are not limited to following:

1. Accurate Partitions Corp.; Does not have product name but meets specification requirements including warranty.
2. Global Partitions; Does not have product name but meets specification requirements including warranty requirements
3. Scranton Products; Hiny Hiders

2.2 REQUIREMENTS

A. Compartment Mounting Styles:

1. Toilet Partition Style: Ceiling Hung
2. Urinal Screen Style: Wall Hung

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.3 MATERIAL

A. Toilet Partition Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE), not less than 1 inch (25 mm) thick, seamless, with edges machined to rounded radius.

1. HDPE (High Density Polyethylene), integrally colored, fabricated from extruded polymer resin forming a single, one-piece, solid construction sheet.
2. Waterproof, non-absorbent, with self-lubricating surface resistant to marks from pens, markers, and paints.
3. Free from urea-formaldehyde resins.
4. No volatile organic compounds (VOC) emissions.
5. Recycled Content: Minimum 25 percent, classified as pre-consumer.
6. Height:

    a. Doors and Panels: 55 inches (1397 mm), mounted 14 inches (356 mm) above finished floor.
    b. Pilasters: Not to exceed 120 inches (3 M) for ceiling hung partitions.

7. Color: as selected by Architect from manufacturer's full range.

B. Urinal Screen, Privacy/Entry Screen Construction: Matching construction and thickness of toilet partition panels.

C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), 6463-T5 Alloy.

D. Stainless Steel: ASTM 167.

E. Zamac: ASTM B 86, commercial zinc-alloy die castings.

F. Finishes:

1. Aluminum:

a. Slide Bolt and Handle: Black Anodized.
b. Other Aluminum Components: Clear Anodized.

2. Stainless Steel: No. 4 satin.

2.4 HARDWARE AND ACCESSORIES

A. Brackets (Fittings):

1. Continuous (Full Height) Type: Heavy duty extruded aluminum, 54 inches (1372 mm) long, secured full height of component, fastened with stainless steel tamper-resistant hex-lobe security fasteners.

B. Hinges:

1. Aluminum, wrap-around type, 8 inches (203 mm) long, fabricated from heavy duty aluminum with wrap-around flanges through-bolted through doors and pilasters with stainless steel tamper-resistant hex-lobe security fasteners.

C. Panel and Pilaster Brackets:

1. Two piece, 1/2 inch (13 mm) diameter nylon pin with "cam action" and 3/16 inch (4.8 mm) stainless steel pin inserted into lower section of pilaster and door.

D. Door Hardware and Accessories:

1. Strike and Keeper: Heavy-duty extruded aluminum, 6 inches (152 mm) long, with wrap-around flanges.

a. Integral Bumper: extruded black vinyl.

2. Slide Latch and Housing: Cast stainless steel, configured to allow emergency access.
3. Door Pulls: Chrome plated Zamac; two required for handicap compartment.
4. Coat Hook and Bumper: Chrome plated Zamac, with black rubber tip.
5. Door Bumper: Chrome plated Zamac.

E. Pilaster Shoes and Sleeves (Caps):

1. 3 inches (76 mm) high, fabricated of stainless steel.

F. Anchorages and Fasteners: Manufacturer's standard exposed stainless steel fasteners, with tamper-resistant hex-lobe security design.

2.5 FABRICATION

A. General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for partition mounted toilet accessories where required for attachment of toilet accessories.

B. Ceiling-Hung Toilet Partitions: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment mechanisms at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all work areas and verify that all applicable measurements, structural supports, and environmental conditions are in accordance with manufacturer's prerequisites for installation.

1. Confirm location and adequacy of blocking and supports required for installation, in both finished walls and structural ceiling (if applicable).

B. Proceed with installation only after the above criteria is met.

3.2 INSTALLATION

A. General: Install in accordance with manufacturer’s instructions and approved Shop Drawings.

B. Set compartments straight, plumb, level, and aligned.

C. Provide uniform clearances at vertical edges of doors from top to bottom.

D. Attach panel and head rail brackets to walls using appropriate anchoring devices.

E. Adjust for floor variations with screw jack integral in pilasters. Conceal floor fastenings with pilaster shoes.

F. Evidence of cutting, drilling, or patching of exposed surfaces in not acceptable.

G. Equip doors with two hinges, door strike/keeper, slide latch, door pull, and coat hook/bumper. Provide one additional bumper/hook on inside of out-swinging doors.

H. For ceiling hung applications, support pilasters from built-in framing, using adjustable hanging studs providing vertical leveling. Conceal ceiling fastenings with pilaster sleeves.

I. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

3.4 FINAL CLEAN UP

A. Follow manufacturer's recommended cleaning procedures for all partition surfaces.

END OF SECTION 102113

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SECTION 102600 - WALL PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Corner guards.

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated.

C. Color Charts for Selection: Manufacturer's finish charts showing full range of standard colors and textures available for units with factory-applied finishes for selection by Architect.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.

B. Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F476.

C. Chemical and Stain Resistance: Provide wall protection system components with chemical and stain resistance in accordance with ASTM D-1308.

D. Single Source Responsibility: Provide all components of the wall protection system manufactured by the same company to ensure compatibility of color, texture and physical properties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in unopened original factory packaging clearly labeled to show manufacturer.

B. Store materials in original, undamaged packaging in a cool, dry place out of direct sunlight and exposure to the elements. A minimum room temperature of 4ºC (40°F) and a maximum 38°C (100°F) should be maintained.

C. Material must be stored flat.

PART 2 - PRODUCTS

2.1 MATERIALS (Basis-of-Design)

A. PVC-Free Thermoplastic: Extruded material should be high impact Acrovyn 4000 with pebblette grain texture, nominal 1.98 mm (.078") thickness. Chemical and stain resistance should be per ASTM D-1308 standards as established by the manufacturer.

B. Aluminum Retainers: Extruder aluminum retainers should be 6063-T6 alloy, nominal 1.57mm (.062") thickness. Minimum strength and durability properties as specified in ASTM B221.

C. Fasteners: All fasteners to be non-corrosive and compatible with aluminum retainers. All necessary fasteners to be supplied from the manufacturer.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

1. Construction Specialties, Inc.

a. Model SM-20AN 90°: Surface mounted corner guards with 76mm (3") legs, 7mm (¼") radiused cover, and aluminum cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Install impact-resistant wall protection units in locations indicated on Drawings.
2. Provide mounting hardware, anchors, and other accessories required for a complete installation.

a. Adjust end caps as required to ensure tight seams.

B. Immediately after completion of installation, clean plastic covers and accessories in accordance with manufacturer's recommended cleaning method.

C. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

3.2 PROTECTION

A. Protect installed materials to prevent damage by other trades. Use materials that may be easily removed without leaving residue or permanent stains.

END OF SECTION 102600

SECTION 102800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Public-use washroom and private shower accessories.

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by the Contracting Officer.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required preventing delay in Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.8-mm (0.0312-inch) minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.9-mm (0.0359-inch) minimum nominal thickness.

C. Galvanized Steel Sheet: ASTM A 653/A 653M, with Z180 (G60) hot-dip zinc coating.

D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Manufacturers:

1. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

a. Bobrick Washroom Equipment, Inc. (Basis-of-Design)
b. American Specialties, Inc.
c. Bradley Corporation.

B. Toilet Paper Dispenser (TPD): Bobrick B-265

C. Paper Towel Dispenser (PTD): Bobrick B-262

D. Soap Dispensers (SD): OFOI

E. Electric Hand Dryers (EHD): Dyson Airblade.

F. Grab Bars:

1. 38-cm (1-1/2 inch) diameter stainless steel tubing with satin finish; safety grip finish; minimum structural strength of 113-kg (250-pounds); concealed mounting.

a. B-6806.99 x 42: (GB1)
b. B-6806.99 x 36: (GB2)
c. B-6806.99 x 18: (GB2)

G. Clothes/Robe Hook: (RH1)

1. Surface-mounted stainless steel clothes/robe hooks with bright polished finish; 2 vertically aligned hooks; concealed mounting.

a. B-233

H. Sanitary Napkin Disposal: (SND1)

1. Surface-mounted stainless steel sanitary napkin disposal with satin finish; all seamless construction; one piece cover secured to container with a full-length stainless steel piano-hinge. Container shall have integral finger depression for opening cover.

a. B-270

I. Change Area Shower Rod: (CASR1)

1. 32-cm (1-1/4 inch) diameter stainless steel tubing with satin finish with one-piece die-formed stainless steel with satin finish surface-mounted flanges at each end.

    a. B-6047 (see drawings for required length)

J. Change Area Shower Curtain: (CASC1)

1. 1780 mm (70-inch) wide x 1830 mm (72-inch) high vinyl shower curtain. Cut to fit opening.

    a. B-204-3

K. Change Area Shower Curtain Hooks: (CASCH1)

1. Stainless steel shower curtain hooks for 32-cm (1-1/4 inch) diameter stainless steel tubing with satin finish with one-piece die-formed stainless steel with satin finish surface-mounted flanges at each end.

    a. B-204-3

L. Baby Changing Station:

1. Horizontal, Wall-Mounted Baby Changing Station
    a. KB200-00

M. Mop Strip: (MS1)

1. Wall-mounted stainless steel mop and broom holder with satin finish; 610 mm (24-inches) long with 3 holders.

    a. B-223 x 24

2.3 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104413 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Semi-recessed fire extinguisher cabinets.

1.3 ACTION SUBMITTALS

A. Product Data.

PART 2 - PRODUCTS

2.1 FIRE-PROTECTION CABINETS

A. Manufacturers:

1. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

a. Larsen; MP10 (4.54 klg (10 lb.) multi-purpose fire extinguisher).

2. Color: Red
3. Trim Style: Square trim semi-recessed.
4. Door and Trim Material: Enameled steel.
5. Door Glazing: Tempered float glass.
6. Door Style: Vertical duo.
7. Accessories: Mounting brackets Identification lettering.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cabinets at 1372 mm (54 inches) above finished floor to top of cabinet.

B. Identification: Apply decal(s) in white lettering to door with letters reading “FIRE EXTINGUISHER” vertically top to bottom.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Portable fire extinguishers.

1.3 ACTION SUBMITTALS

A. Product Data.

1.4 QUALITY ASSURANCE

A. Fire Extinguishers: NFPA 10 listed and labeled for the type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS AND BRACKETS

A. Portable Fire Extinguishers:

1. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 4.54 kg (10-lb) nominal capacity.

B. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for fire extinguishers indicated, with plated or baked-enamel finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install mounting brackets in locations indicated at 1220 mm (48 inches) above finished floor to top of fire extinguisher.

B. Install fire extinguishers on mounting brackets and in fire extinguisher cabinets where indicated.

END OF SECTION 104416

SECTION 105123 – PLASTIC-LAMINATE-CLAD LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the Solicitation and Division 00 and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad wood lockers

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of plastic-laminate-clad wood locker.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of locker.

C. Shop Drawings: For plastic-laminate-clad wood lockers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for items installed in lockers.
4. Show locker fillers, trim, base, sloping tops, and accessories.
5. Show locker numbering sequence.

D. Samples: For each exposed surface provide manufacturer's full range of factory-applied samples for selection by Architect.

E. Sample special of warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

B. Warranties: Completed manufacturer’s special warranty as described in the “Warranties” Article of this specification section.

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. Full-size locker doors, complete with specified door hardware. Furnish no fewer than five doors of each type and color installed.
2. Full-size units of the following locker hardware items equal to 10 percent of amount installed for each type and finish installed, but no fewer than five units:

    a. Hinges.
    b. Pulls.
    c. Shelf rests.
    d. Cylinder and drawer locks.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install lockers 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: Where lockers 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.

C. Locate concealed framing, blocking, and reinforcements that support lockers by field measurements before being enclosed, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where lockers are indicated to fit to other construction, establish dimensions for areas where lockers are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of concealed wood support bases.

1.8 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of lockers that fail in materials or workmanship within specified warranty period.

    1. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.2 PLASTIC-LAMINATE-CLAD WOOD LOCKERS

A. Manufacturers and Products

1. Basis-of Design Manufacturer and Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Ideal Products, Inc.; Ideal 3000-1 with Lower Cubby

B. Construction Style: Flush overlay.

C. Locker Body: Fabricated from particleboard-core panels covered on both sides with thermoset decorative overlay.

1. Side, Top, and Bottom Panels: Manufacturer's standard 3/4 or 5/8 inch (19 or 16 mm) thick.
2. Back Panel: Manufacturer's standard 1/2 or 3/8 inch (13 or 9.5 mm) thick.
3. Exposed Panel Edges: Thermoset decorative overlay to match panel.

D. Plastic-Laminate-Clad Wood Doors: High-pressure decorative laminate, Grade VGS, over both sides of particleboard core.

1. Thickness: Manufacturer's standard 3/4 or 5/8 inch (19 or 16 mm) thick.
2. Panel Edges: High-pressure decorative laminate, Grade VGS, to match panels.

E. End Panels: Match style, material, construction, and finish of plastic-laminate-clad wood doors.

F. Corners and Filler Panels: 3/4-inch- (19-mm-) thick panels. Match style, material, construction, and finish of plastic-laminate-clad wood doors.

G. Continuous Finish Base: Plastic-laminate-clad, 3/4-inch- (19-mm-) thick panel that matches door faces; fabricated in lengths as long as practical to enclose base and base ends of lockers.

H. Plastic-Laminate Colors, Patterns, and Finishes:

1. As selected by Architect from manufacturer’s full range of plastic laminate samples.

2.3 MATERIALS

A. Composite Wood: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Particleboard:ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
2. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

B. High-Pressure Decorative Laminate: NEMA LD 3, grades as follows:

1. Postformed Benchtop: Grade HGP.
2. Vertical Surfaces: Grade VGS.

C. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

D. 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 nonferrousmetal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors. E. Wood Support Base: As specified in Division 06 Section “Rough Carpentry”.

2.4 HARDWARE

A. General: Provide manufacturer's standard locker hardware complying with the requirements in this Section.

B. Recessed Padlock Hasp: Steel; finished to match other locker hardware.

C. Frameless Hinges (European Type): Fully concealed, self-closing, nickel-plated steel, with not less than 125 degrees of opening.

1. Provide two hinges for doors 36 inches (910 mm) high and less.

D. Pulls: Manufacturer’s standard design.

E. Hooks: Manufacturer's standard, ball-pointed aluminum or steel; chrome finished. Attach hooks with at least two fasteners.

1. Provide one double-prong ceiling hook for each compartment of double-tier lockers.

F. Exposed Hardware Finishes: Polished chrome unless otherwise indicated.

2.5 ACCESSORIES

A. Number Plates: 1-1/2-inch- (38-mm-) diameter, etched, embossed, or stamped, metal plates with black numbers and letters at least 1/2 inch (13 mm) high. Identify lockers in sequence indicated on Drawings. Finish plates to match other locker hardware.

2.6 FABRICATION

A. Fabricate components square, rigid, without warp, and with finished faces flat and free of scratches and chips. Accurately factory machine components for attachments. Make joints tight and true.

B. Venting: Manufacturer’s standard.

C. Complete fabrication, including assembly, finishing, 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.

D. Shop cut openings, to maximum extent possible, to receive hardware, 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 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify that furring is attached to concrete and masonry walls that are to receive lockers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Condition lockers to average prevailing humidity conditions in installation areas before installation.

B. Before installing lockers, examine factory-fabricated work for completeness and complete work as required, including removal of packing.

3.3 INSTALLATION

A. Install wood support base with 1/2-inch- (13-mm-) thick plywood top if recommended by locker manufacturer.

B. Install lockers level, plumb, and true; use concealed shims.

C. Connect groups of lockers together with manufacturer's standard fasteners, through predrilled holes, with no exposed fasteners on face frames. Fit lockers accurately together to form flush, tight, hairline joints.

D. Install lockers without distortion so doors fit openings properly and are accurately aligned. Adjust hardware to center doors in openings, providing unencumbered operation. Complete installation of hardware and accessory items as indicated.

E. Installation Tolerance: No more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line. Shim as required with concealed shims.

F. Locker Anchorage: Fasten lockers through wood locker base, at ends, and not more than 36 inches (910 mm) o.c. with No. 8 flush-head wood screws sized for 1-inch (25-mm) penetration into wood base.

G. Locker Anchorage: Fasten wood lockers through back, near top and bottom, at ends with No. 8 flush-head wood screws sized for 1-inch (25-mm) penetration into framing, blocking, or furring and spaced not more than 16 inches (400 mm) o.c.

H. Scribe and cut corner and filler panels to fit adjoining work using fasteners concealed where practical. Repair damaged finish at cuts.

I. Attach sloping-top units to lockers, with end panels covering exposed ends.

J. Install number plates after lockers are in place.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Clean, lubricate, and adjust hardware. Adjust doors to operate easily without binding. Verify that integral locking devices operate properly.

B. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

C. Touch up marred finishes, or replace lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105123

SECTION 105500 - POSTAL SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Envelope Depository Unit

1.2 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For postal specialties. Include plans, elevations, sections, details, identification sequence for compartments, and attachments to other work.

1.3 CLOSEOUT SUBMITTALS

A. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

1.4 REGULATORY REQUIREMENTS

A. Comply with Americans with Disabilities Act Accessibility Guidelines (ADAAG).

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inspect the materials upon delivery to assure that specified products have been received.

B. Store materials protected from exposure to harmful weather conditions.

C. Handle materials to prevent damage or marring of finish.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of postal specialties that fails in materials or workmanship within Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Manufacturer and Product: Subject to compliance with requirements, available manufacturer and product that may be incorporated into the Work include, but not limited to following:

1. Interbank Equipment; Model EDU

2.2 MATERIALS

A. Aluminum: Manufacturer's standard alloy and temper for type of use and finish indicated.

B. Sheet Steel: Manufacturer's standard metal for type of use and finish indicated.

2.3 ENVELOPE DEPOSITORY UNIT

A. Exterior through-wall payment drop box for drive-through or walk-up payment of water utility bill payments

1. Exterior Head: Face of wall mounted stainless steel exterior head that is 7-1/2 inches high x 10-3/4 and has a protective rainshield and weatherized liftplate. Slot opening is 5/8 inches high by 6-1/2 inches wide. Two (2) welded studs are welded on back to fasten securely to chute brackets. Provide (2) black signs on face of exterior head as follows:

    a. On liftplate: LIFT TO DEPOSIT
    b. On face of hood below liftplate: PAYMENT DROP

2. Delivery Chute: To be constructed of manufacturer's standard heavy gauge factory finished metal that is 2-1/2 inches high by 6-3/4 inches wide, cut to fit wall depth, continuously welded to locked chest and factory finished.

    a. Anti-fish teeth welded at end of chute to prevent exterior retrieval of locked chest contents.

3. Locked Collection Box: To be constructed of manufacturer's standard heavy gauge factory finished metal that is 8 inches deep, 24 inches high, and 12 inches wide that is factory finished with integral locked access door.

    a. Locked Access Door: Material of same gauge and finish as locked chest with keyed lock entry.

        1) Keyed lock shall have removable core that will be furnished by the Owner and installed by the Contractor.

2.4 FABRICATION

A. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs and safe to touch.

B. Preassemble postal specialties in shop to greatest extent possible to minimize field assembly.

C. Form joints exposed to weather to exclude water penetration.

D. Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Where dissimilar metals will be in permanent contact with each other, protect against galvanic action by painting contact surfaces with bituminous coating or by applying other permanent separation.
2. Where aluminum will contact grout, concrete, masonry, or wood, protect against corrosion by painting contact surfaces with bituminous coating.

B. Exterior Head: Install exterior head with center line of horizontal mail slot at 40 inches (1016 mm) above exterior finished grade.

C. Collection Box: Install collection box at location above finished floor as shown on the drawings.

3.2 ADJUSTING

A. Adjust doors and locks to operate correctly.

3.3 CLEANING

A. Clean surfaces with mild dish detergent. Do not use harsh abrasive cleaners. Lubricate locks with graphite type lubricants only.

3.4 PROTECTION OF INSTALLED PRODUCTS

A. Protect finishes from damage by construction activities.

END OF SECTION 105500

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SECTION 107113 – EXTERIOR SUN CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes fabricated exterior sun control devices.

1.3 REFERENCE STANDARDS

A. AAMA 2603 - High Performance Organic Coatings on Architectural Extrusions and Panels.

B. AAMA 2605 - High Performance Organic Coatings on Architectural Extrusions and Panels.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

E. ASTM D822 - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

F. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

G. ASTM D2244 - Standard Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates.

1.4 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: Submit copies of manufacturer's standard guide specifications, standard detail drawings, and installation procedures,

1. Provide information pertaining to standard components, sizes, shapes, and hardware description

C. Shop Drawings representing Designer's intent: Plans, elevations, sections, details with profiles, styles, part numbers, dimensions, materials, finishes, connections, method of anchorage, type of anchors and backing supports.

1. Differentiate between shop fabrication and field installation.
2. Indicate substrates and adjacent work specified in related sections with which the exterior sun control devices must be coordinated.

3. Indicate connections to building framing.

D. Color Charts for Selection: Manufacturer's finish charts showing full range of standard colors and textures available for units with factory-applied finishes for selection by Architect.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 CLOSEOUT SUBMITTALS

A. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

1.6 QUALITY ASSURANCE

A. Sunshade systems shall be manufactured by a firm with a minimum of 5 years of experience in the design, engineering, and fabrication of similar systems.

B. Professional Engineer Qualifications: A professional engineer legally qualified to practice in jurisdiction where Project is located and experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of products that are similar to those indicated for this Project in material, design, and extent.

C. Source Limitations: Obtain products through one source from a single manufacturer where alike in one or more respects regarding type, design, or factory-applied color finish.

1.7 SEQUENCING AND SCHEDULING

A. Field Measurements: Verify openings and adjacent construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

B. Installer shall verify actual measurements/connections by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.9 Warranty:

A. Provide manufacturer's standard limited warranty for 70% fluoropolymer-based finish on aluminum substrates.

B. Warranty Period: 10 years.

1. Finish coating shall not peel, blister, chip, crack, or check.
2. Chalking, fading or erosion of finish when measured by the following tests:
3. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D4214.
4. Finish coating shall not change color or fade in excess of 5 NBS units as determined by ASTM D2244 and ASTM D822.
5. Finish coating shall not erode at a rate in excess of .01 mils/year confirmed by Florida test samples.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

1. Airolite Co., (The); ASC8

2.2 PERFORMANCE REQUIREMENTS

A. Sun control device supports: Design and furnish all supports required to design load of up to 60 pounds per square foot (2.87 kPa). The design load includes loads derived from wind, snow (including drift), seismic events, and the dead load of the sunshade. Sun Control members, blades, outriggers, fascia, and anchorages shall be demonstrated to withstand the specified design load.

B. Sun control device shall be factory engineered to withstand wind loads, acting upwards and downwards.

1. Minimum design loads shall be calculated to comply with ASCE - 7, or local requirements of Authority Having Jurisdiction.

C. Sun control devices shall be factory engineered to withstand the thermal stress to which the louvers will be subjected.

1. Base engineering on a surface design temperature change of 180 degrees F (82 degrees C).

D. Sun control devices shall be designed to perform under conditions specified herein or required by site conditions with no permanent damage to or deforming of the louver blades or assembly, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors.

2.3 AIRFOIL BLADE DESIGN

A. Product: ASC8: 8 inches (203 mm) airfoil blade.

1. Blade Type: Airfoil.

2. Blade Material: Extruded Aluminum (Alloy 6063-T5).
3. Blade Material Thickness: 0.081 inch (2.06 mm).
4. Blade Width: 8 inches (203.2 mm).
5. Outrigger Length: 42 inches (1070 mm)
6. Outrigger Material: Aluminum Plate (Alloy 6061-T6).
7. Outrigger Material Thickness: 0.250 inch (6.35 mm).
8. Fascia: 8 inches (203.2 mm) Rectangular Tube (standard).
9. Mounting: Extruded Aluminum Tee as indicated.
10. Construction: Mechanically Fastened (standard).

2.4 ALUMINUM FINISHES

A. High-Performance Organic Coating Finish:

B. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

C. Chemical Finishes: Cleaned with inhibited chemicals and acid-chromate-fluoride-phosphate conversion coating.

D. Fluoropolymer Three-Coat Coating System: Manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605. 2.0 mils (.05 mm) dry film thickness.

1. Color and Gloss: As selected by Architect from manufacturer's full range of colors and glosses.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate conditions in areas to receive the work. Verify dimensions, tolerances, and interface with adjacent work. Do not proceed until any unsatisfactory conditions have been corrected.

B. Upon receipt of sun control devices, thoroughly examine units for damage. Promptly report any observed damage to manufacturer in writing. Include digital photographs of any observed damage as well as a copy of the Bill of Lading disclosing the damage.

3.2 PREPARATION

A. Prior to fabrication, field verify required dimensions.

B. Coordinate sun control device installation with wall construction to ensure proper structural support is provided for attachment.

3.3 INSTALLATION

A. Install in accordance with manufacturer's written instructions and recommendations for installation of the work.

B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated and fitted to the structure.

C. Anchor sun control devices to wall supports as indicated on approved shop drawings, and as specified.

D. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of galvanic action between metals.

E. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.

F. Set units level, plumb and true to line, with uniform joints.

G. Sun Control Device installation:

1. Layout and verify centerline dimensions prior to setting outriggers.
2. Install the two outer most outriggers plumb and level to the substrate.
3. Then, shoot a line from outrigger to outrigger to find the depth dimension of the outer line.
4. Proceed with the installation by attaching the middle outrigger, shimming as required.
5. Shims: Non-ferrous, as recommended by manufacturer. Verify centerline dimensions after shims are installed.

H. Erection Tolerances:

1. Variation from level: +/- 1/8 inch maximum in 20 foot runs, non-cumulative.

    a. Maximum Offset from True Alignment between Adjacent Members Butting or In-Line: 1/16 inch.

I. Do not field cut or trim units. Cut and trim component parts during erection only with the approval of the manufacturer, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly as directed.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.4 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

C. Clean aluminum surfaces in accordance with recommendations found in AAMA 609 and 610. Do not use aggressive alkaline, TSP, acid cleaners, or abrasive cleaners on aluminum surfaces.

END OF SECTION 107113

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SECTION 107516 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes.

1. Ground-set flagpoles made from aluminum.
2. Cast-in-place concrete foundation system for flagpoles.

B. Owner-Furnished Material: Flag(s)

1.2 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

C. Shop Drawings: For flagpoles.

1. Include plans, elevations and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
2. Include section, and details of foundation system.

D. Delegated-Design Submittal: For flagpoles.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to provide comprehensive engineering analysis, using performance requirements and design criteria indicated to design flagpole assemblies and foundation.

B. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.

1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is 90 mph.
2. Flag Size for Design: 4'x 6'

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2 ALUMINUM FLAGPOLES

A. Aluminum Flagpoles: Cone-flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm).

B. Exposed Height: 25 feet (7.5 m).

C. Construct flagpoles in one piece. Splices with fasteners or exposed welds are not acceptable.

D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch (1.52-mm) wall thickness with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch- (19-mm-) diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.

1. Flashing Collar: Same material and finish as flagpole.

E. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.

1. Flashing Collar: Same material and finish as flagpole.

F. Cast-Metal Shoe Base: Made from aluminum with same finish and color as flagpoles for anchor-bolt mounting; furnish with anchor bolts.

1. Furnish ground spike.
2. Furnish aluminum base or aluminum flashing collar finished to match flagpole.

2.3 FITTINGS

A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. 0.063-inch (1.6-mm) spun aluminum, finished to match flagpole.

B. Internal Halyard, Winch System: Manually operated winch with control stop device and removable handle, stain-steel cable halyard, and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.

1. Halyard Flag Snaps: Stainless-steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.

2.4 MISCELLANEOUS MATERIALS

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.

B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.

C. Sand: ASTM C 33/C 33M, fine aggregate.

D. Elastomeric Joint Sealant: Single-component neutral-curing silicone joint sealant complying with flagpole manufacturer's recommendations

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.5 ALUMINUM FINISHES

A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.

B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.

C. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.

D. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.

E. Place concrete for flag pole foundation per specification section "Cast-in-Place Concrete". Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use nonstaining curing compound.

F. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.

B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surface smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION 107516

SECTION 111300 – LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Dock bumpers
2. Dock seals
3. Wall mounted rain hoods

1.3 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for loading dock equipment. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings: For loading dock equipment. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

D. Qualification Data: For qualified Installer.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For loading dock equipment to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Each component of dock equipment is required to from the same manufacturer.

B. Manufacturer’s Qualifications: Company specializing in manufacturing Products specified in this Section with minimum ten years documented experience.

C. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store and handle dock seals and shelters in a manner to avoid significant or permanent damage to fabric or frame.

1. Comply with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with loading dock equipment, including recessed pit dimensions slopes of driveways and heights of loading docks, by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 LOADING DOCK BUMBERS

A. Integral Laminated-Tread Dock Bumper: Fabricated from 6-inch thick, multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4-inch diameter, steel supporting rods that are welded at one end to 1/4-inch thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch of tread plies extending beyond the face of closure angles.

B. Locations: As indicated on drawings.

2.2 FOAM PAD DOCK SEALS

A. General: Dock seals consisting of fabric covered foam pads designed to compress 4 to 5 inches under pressure of truck body to form an airtight seal at jamb and head of loading dock openings; of type, size and construction indicated.

1. Basis-of-Design Manufacturer and Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Manufacturer: Rite-Hite Corporation
b. Product: Frommlet - LP

B. Door Opening Size: As indicated on Drawings.

C. Stationary Head Pad: 24 inches high and same depth as jamb pads; beveled; sized for opening width.

D. Jamb Pads: Beveled; tapered to reduce opening width.

1. Nominal Size: 12-inches wide and sized for opening height.

E. Construction: Consisting of single- or double-ply, coated, fabric-covered, urethane-foam core with supporting frame. Fabricate jamb and head pads of same depth and sized for opening width.

1. Steel Support Frame: Steel channel frame of manufacturer's standard weight, shape, and finish; with steel mounting hardware.
2. Cover Fabric: Hypalon-coated nylon with minimum total weight of 40 oz./sq. yd.

    a. Color: Black.

3. Pleated Protectors: On face of jamb pads of overlapping layers of coated fabric attached to base fabric; 4-inch wear exposure.

2.3 WALL MOUNTED RAIN HOOD

A. Basis-of-Design Manufacturer and Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Manufacturer: Rite-Hite Corporation
2. Product: Frommlet - Raingurad RG-3000

B. Size: 10 feet wide by 24 inch projection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of loading dock equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete and furnish anchoring devices with templates, diagrams, and instructions for their installation.

B. Clean recessed pits of debris.

3.3 INSTALLATION

A. General: Install loading dock equipment and accessories as required for a complete installation.

B. Dock Bumpers: Attach dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.

C. Dock Seals and Rain Hood: Attach dock-seal support frames securely to building structure in proper relation to openings, dock bumpers, and dock levelers to ensure compression of dock seals when trucks are positioned against dock bumpers.

3.4 ADJUSTING

A. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.

B. After completing installation of exposed, factory-finished loading dock equipment, inspect exposed finishes and repair damaged finishes.

END OF SECTION 111300

SECTION 142413 – HOLELESS HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes machine room-less (MRL) electric traction passenger elevators.

1.3 REFERENCE CODES AND STANDARDS

A. ANSI A117.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.

B. ADAAG, Americans with Disabilities Act Accessibility Guidelines.

C. ANSI/NFPA 70, National Electrical Code.

D. ANSI/NFPA 80, Fire Doors and Windows.

E. ASME/ANSI A17.7, Safety Code for Elevators and Escalators.

F. ANSI/UL 10B, Fire Tests of Door Assemblies.

G. National Electric Code (NEC)

H. Applicable NEMA Standards

I. Applicable OSHA Standards

J. Local Building Codes

1.4 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures, hoistway entrances, and operation, control, and signal systems.

C. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.
2. Include large-scale layout of car-control station and standby power operation control panel.
3. Indicate maximum dynamic and static loads imposed on building structure at points of support, and maximum and average power demands.

D. Samples for Initial Selection: For finishes involving color selection.

E. Qualification Data: For Installer.

F. Sample Warranty: For special warranty noted in “Warranty” Article.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway, pit, and control closet layout and dimensions, as shown on Drawings, and electrical service including standby power generator, as shown and specified, are adequate for elevator system being provided.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. Include diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

C. Warranty: For special warranty noted in “Warranty” Article.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer only, third party installers are not permitted.

B. Permits, Inspections and Certificates: The elevator manufacturer shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations or such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.9 JOB CONDITIONS

A. Elevator manufacturer acceptance of elevator as designed: By submitting pricing for elevator, elevator manufacturer accepts that the equipment as shown and specified for this project is properly designed and engineered. Should additional design or engineering be required, additional costs shall be borne by the elevator manufacturer.

B. Temporary use: Temporary elevator use during construction shall be in accordance with the General Requirements section.

C. Storage: A dry and protected area, conveniently located to the elevator hoistway, will be assigned to the elevator manufacturer without cost, for storage of his materials, equipment and tools.

1.10 COORDINATION

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Furnish well casing and coordinate delivery with related excavation work.

C. Coordinate locations and dimensions of other work relating to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.11 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

B. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

C. Warranty Period: One year from date of Substantial Completion.

1.12 MAINTENANCE and SERVICE

A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of [Select the appropriate new installation maintenance period: three (3) months after the elevator has been turned over for the customer's use. This service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days. This service shall not cover adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.

B. The periodic lubrication of elevator components **shall** be required, including: Sheaves, Rails, Belts, Ropes, Car and CWT guides, etc.

C. The elevator control system must:

1. Provide in the controller the necessary devices to run the elevator on inspection operation.
2. Provide on top of the car the necessary devices to run the elevator in inspection operation.

3. Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.
4. Provide in the event of a power outage, means from the controller to electrically lift and control the elevator brake to safely bring the elevator to the nearest available landing.
5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.

D. Provide system capabilities to enable a remote expert to create a live, interactive connection with the elevator system to enable the following functions:

1. Remotely diagnose elevator issues with a remote team of experts
2. Remotely return an elevator to service
3. Provide real-time status updates via email
4. Remotely make changes to selected elevator functions including:

a. Control building traffic: Restrict floor access, remove car from group operation, shut down elevator, select up peak/down peak mode, activate independent service
b. Conserve energy: Activate cab light energy save mode, activate fan energy save mode, shut down car(s)
c. Improve passenger experience: Extend door open times, change parking floor, activate auto car full, activate anti-nuisance, advance door opening, door nudging, extend specific floor extended opening time, release trapped passengers

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to following:

1. The Otis Elevator Company, HydroFit Machine-Room Less Holeless Hydraulic elevator.
2. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances shall be manufactured by a single manufacturer.

B. Equipment Control: Elevonic® Control System.

1. Controller located entirely inside the hoistway. No extra machine room or control closet space required.
2. An AC gearless machine using embedded permanent magnets mounted at the top of the hoistway.
3. Polyurethane Coated-Steel Belts for elevator hoisting purposes.
4. Regenerative drive that captures normally wasted energy and feeds clean power back into the building's power grid.
5. LED lighting standard in ceiling lights and elevator fixtures.

6. Sleep mode operation for LED ceiling lights and car fan.

C. Elevator EL-1:

1. Drive: Regenerative
2. Quantity of Elevators: One (1)
3. Stops: 2 Front, 1 Rear
4. Openings: 2 Front, 1 Rear
5. Travel: 15'-4 ¾"
6. Rated Capacity: 3,500 lbs.
7. Rated Speed: 125 fpm
8. Platform Size: 5'-6 1/8"D x 6'-5 9/16"W
9. Clear Inside Dimensions: 7'-5 1/4"D x 8'-4"W
10. Cab Height: 7'-9"
11. Clear Cab Height: 7'-9" with 5/16" floor recess and 4 LED ceiling
12. Entrance Type: Side-Open, two speed doors at 42" (1219 mm)
13. Entrance Height: 7'-0" (2134 mm)
14. Controller Location: Inside hoistway, accessible by a door in a side hoistway wall on the 1st landing.
15. Machine Location: No machine-room required, tank and controller in hoistway pit.

D. Freight Elevator EL-2

1. Drive: Regenerative
2. Quantity of Elevators: One (1)
3. Stops: 3
4. Openings: 3 Front, 1 Rear
5. Travel: 19'-5 3/8"
6. Rated Capacity: 4,500 lbs.
7. Rated Speed: 125 fpm
8. Platform Size: Custom Size to match existing shaft.
9. Clear Inside Dimensions: Custom Size to match existing shaft.
10. Cab Height: 7'-9"
11. Clear Cab Height: 7'-9" with 5/16" floor recess and 4 LED ceiling
12. Entrance Type: Center-Open, two speed doors at 54" (1219 mm)
13. Entrance Height: 7'-0" (2134 mm)
14. Controller Location: Control Room
15. Machine Location: Headhouse

E. Main Power Supply: 208 Volts + or - 5% of normal, three-Phase, with a separate equipment grounding conductor. Transformer (by others) required for voltages other than 208 volts.

F. Car Lighting Power Supply: 120 Volts, Single-phase, 15 Amp, 60 Hz.

G. Signal Fixtures: Manufacturer's standard with metal button targets (exc. CA).

H. Stopping Accuracy: ±1/4" (6.4 mm) under any loading condition or direction of travel.

I. Operation:
Simplex Collective Operation: Using a microprocessor-based controller, operation shall

be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

J. Operating Features – Standard

1. Full Collective Operation
2. Fan and Light Protection.
3. Full Collective Operation.
4. Firefighters' Service Phase I and Phase II
5. Top of Car Inspection.
6. Automatic Standby Power Operation with Manual Override.

K. Door Control Features:

1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.
2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person. Door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening.
3. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

2.2 EQUIPMENT: CONTROLLER COMPONENTS

A. Controller: A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.

1. All high voltage (110V or above) contact points inside the controller shall be protected from accidental contact when the controller doors are open.
2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
3. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)
4. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): “EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity”
5. Controller shall be located inside the wall next to the top landing entrance frame. Emergency access shall be provided through an access panel in the entrance frame secured by a key lock.
6. A separate control room or cabinet should not be required.

B. Drive: A Variable Voltage Variable Frequency AC drive system shall be provided. The drive shall be set up for regeneration of AC power back to the building grid.

2.3 EQUIPMENT: Hoistway Components

A. Plunger(s) and Cylinder(s): Each cylinder shall be constructed of steel pipe of sufficient thickness and suitable for the operating pressure. The top of each cylinder shall be equipped with a cylinder head with a drip ring to collect any oil seepage as well as an internal guide ring and self-adjusting packing. Each plunger shall be constructed of

selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish. Each plunger shall be provided with a stop ring electrically welded to it to prevent the plunger from leaving the cylinder. Each plunger and cylinder shall be installed plumb and shall operate freely with minimum friction.

B. Car Guide Rails: Tee-section steel rails with brackets and fasteners.

C. Polyurethane type buffers shall be used.

D. Wiring: Wiring for hoistway electrical devices included in scope of the elevator system, hall panels, pit emergency stop switch, and the traveling cable for the elevator car.

E. Hoistway Entrances:

1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.
2. Sills shall be extruded aluminum or bronze finish, or nickel silver finish.
3. Doors: Entrance doors shall be of metal construction with vertical channel reinforcements.
4. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour (for M1, M2, M3, D1, and D2 Entrance Arrangements or 1 hour for D3 Entrance Arrangement.
5. Entrance Finish: [This paragraph may be written as needed to indicate specific entrance finishes by the opening. Clearly indicate landing/opening designations for each finish. For example: "Lobby - satin finish stainless steel, floors 2 through 8 - with white paint." Frame & Door finish can be independent.]

    a. Paint, Color to be selected from the manufacturer's color chart.

6. Entrance marking plates: Entrance jambs shall be marked with 4" x 4" (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.
7. Sight Guards: sight guards will be furnished with all doors painted to match with painted doors, painted black for stainless steel and gold satin doors.

F. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway

G. Provide ladder for pit access.

2.4 EQUIPMENT: CAR COMPONENTS

A. Car frame and Safety: A car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the car frame and shall be Type "B", flexible guide clamp type.

1. EL-1 Cab: Steel Shell Cab with Plastic Laminate vertical removable panels, to be selected from manufacturer’s catalog of choices.
2. EL-2 Cab: Steel Shell Cab with painted vertical removable panels, to be selected from manufacturer’s catalog of choices.

B. Car Front Finish: Satin Stainless Steel

C. Car Door Finish: Satin Stainless Steel.

D. Ceiling Type: Flat steel ceiling, Real White (EWO) with 4 LED lights.

E. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car in the event of building power failure.

F. Fan: A one-speed 120 VAC fan will be mounted to the ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.

G. Handrail: Handrails shall be provided on the side walls of the car enclosure. Handrails shall be 3/8" x 2" (9.5 mm x 51 mm) flat tubular handrail with a Brushed Steel Finish.

H. Threshold: Extruded Aluminum.

I. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

J. Guides: The car shall have 3" diameter roller guides at top and bottom and the counterweight shall have slide type guides at the top and the bottom.

K. Platform: The car platform shall be constructed of metal. Load weighing device shall be mounted on the belts at the top of the hoistway.

L. Certificate frame: Provide a Certificate frame with a satin stainless steel finish.

M. The LED ceiling lights and the fan should automatically shut off when the system is not in use and be powered back up after a passenger calls the elevator and pushes a hall button.

2.5 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: A car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless steel finish.

1. A car operating panel shall be furnished. It shall contain a bank of round stainless steel, mechanical LED illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served. All buttons to have raised numerals and Braille markings with:

2. Flat Flush Mounted satin stainless steel button with blue or white LED illuminating halo or gold satin button with white LED illuminating halo.

3. The car operating panel shall be equipped with the following features:

    a. Raised markings and Braille to the left hand side of each push-button.
    b. Car Position Indicator at the top of and integral to the car operating panel.
    c. Door open and door close buttons.
    d. Inspection key-switch.
    e. Elevator Data Plate marked with elevator capacity and car number.

f. Help Button: The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
g. Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
h. In car stop switch (toggle or key unless local code prohibits use).
i. Firefighter's hat.
j. Firefighter's Phase II Key-switch.
k. Call Cancel Button.

B. Car Position Indicator: A digital, LED car position indicator shall be integral to the car operating panel.

C. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Integral Hall fixtures shall feature round stainless steel, mechanical buttons marked to correspond to the landings. Hall fixtures to be located in the entrance frame face **or** the wall. Buttons shall be in vertically mounted fixture. Fixture shall be satin stainless steel.

1. Flat Flush Mounted satin stainless steel button with blue or white LED illuminating halo or gold satin button with white LED illuminating halo.

D. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, pits, and machine rooms as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.

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 INSTALLATION

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/4 inch (6 mm), up or down, regardless of load and travel direction.

G. Set sills flush with finished floor surface at landing.

H. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. Place hall lanterns either above or beside each hoistway entrance.
2. Mount hall lanterns at a minimum of 72 inches (1829 mm) above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of two hours or less.

END OF SECTION 142413

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SECTION 144500 – VEHICLE LIFTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Base Bid: Section includes Owner furnished, Contractor Installed Vehicle lifts including safety equipment, controls and accessories of the following types:

1. 25,000 lb-130,000 lb parallelogram drive on surface and flush mounted lifts.

a. Rolling Jacks

B. Alternate Bid 1: Section includes Contractor furnished, Contractor Installed Vehicle lifts including safety equipment, controls and accessories of the following types:

1. 25,000 lb-130,000 lb parallelogram drive on surface and flush mounted lifts.

a. Rolling Jacks

1.3 REFERENCES

A. ALI: Automotive Lift Institute.

B. ANSI/ALI ALCTV: Safety Requirements for the Construction, Testing, and Validation of Automotive Lifts.

C. International Standards Organization (ISO): ISO 9001 Quality management systems - Requirements.

D. Underwriters Laboratories Inc. (UL): UL201 - These requirements cover garage equipment, rated not more than 600 volts, for use in accordance with the National Electrical Code, NFPA 70.

1.4 ACTION SUBMITTALS

A. General: Provide action submittals for all items in this specification section for review within a single submittal to the Architect.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation manual.
4. Operations manual.
5. Maintenance manual.

6. Safety manual.

C. Shop Drawings: Template drawings and load reactions for lift application.

D. Qualification Data: For qualified Installer provide manufacturer's approval letter.

1.5 CLOSEOUT SUBMITTALS

A. Warranties: Completed manufacturer's special warranties as described in the "Warranties" Article of this specification section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Factory trained authorized company, company insured for completed operations of installing lift.

B. In addition to the other requirements outlined herein, the lift or lifts, shall comply with all applicable requirements of ANSI standards. "Safety Requirements for the Construction, Care and Use of Automotive Lifts" as published by the American national Standards Institute. The lift company Quality Management System shall be ISO9001 certified.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty for failures due to defective materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of Design Manufacturer: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Rotary Lift

2.2 50,000 LB & 75,000 LB PARALLELOGRAM DRIVE FLUSH MOUNTED LIFTS

A. General: This project contains two (2) parallelogram drive flush mounted vehicle lifts. Reference drawings for location of each lift.

B. Lift Characteristics:

1. Assembly shall consist of an electro-hydraulic lift unit, a control console and accessories. The control console shall be connected by required lengths of

stainless steel hydraulic pipe or steel reinforced hydraulic hose, nylon compressed air line and electrical cable approved for use by the code authority of jurisdiction.

a. Each platform shall be constructed of steel plate supported by steel tubes.

2. Paint:

a. Marine grade paint zinc primer and epoxy top coats on baseplates. The control panel, lift legs and runways are epoxy coated only.
b. The lift shall be driven by a hydraulic pump of U.S. manufacture, capable of supplying the appropriate psi and gpm to operate the lift.
c. The lift shall be able to be lowered from any raised position by operation of a manual pump and valve

3. Hydraulic System:

a. Each hydraulic cylinder shall have a flow check integrally mounted to prevent collapse in the event of a major fluid leak.
b. The lift shall be driven by a hydraulic pump of U.S. manufacturer, capable of supplying the appropriate psi and gpm to operate the lift.
c. The lift shall be able to be lowered from any raised position by operation of a manual pump and valve.

4. Safety Locks:

a. Steel safety locks with a safety factor of not less than 3:1 shall be mounted one set to each lifting cylinder and shall allow the lift to be locked at a minimum of 8 different levels.

5. The lift shall have full-length continuous safety edges mounted to the lower surface of the main lifting platform. Safety tape switch will be located on the outside of both platforms. When any of these safety edges are displaced horizontally or vertically, the lift will stop. Safety edges inside optional.
6. Control console shall house the following equipment:

a. Oil reservoir, suction strainer, low pressure return filter, hydraulic gear pump and manual pump.
b. Electrical enclosures for control components shall be NEMA 12 rated (minimum) and have the following controls mounted on them while still maintaining their sealing ability:
c. Systems disconnect.
d. "Power-On" pilot lamp.
e. "Raise" and "Lower" controls and "Press to lock lift" control.
f. "Operator Lock-Out" pilot lamp.

7. The control system shall be operated by a Programmable Logic Control (PLC) and lock-out all operations of lift controls if an unsafe condition exists due to insufficient air pressure to operate safety locks; displaced safety edges, locks not

disengaged or uneven platform heights. This lock-out shall not be able to be reset unless unsafe condition has been corrected.

a. The control system shall ensure that lifting platforms differ in height by no more than 2 inches (51 mm). If platforms become uneven by a greater amount, the lift shall stop and lock-out operator.

8. Lighting System (Optional):

a. Main lifting platforms shall have fluorescent lights installed on their inner edges to illuminate the work area beneath the vehicle when raised on the lift.
b. Lighting system shall turn on automatically when lift unit is raised above 22 inches (559 mm), (18 inch (457 mm) lamp height), and shall turn off automatically when lift unit descends below 22 inches (559 mm) per National Electric Code Section 511-1 through 511-3.

C. Capacity:

1. Model: 50/28F: 50,000 lbs. (22680 kg).
2. Model: 75/30F: 75,000 lbs. (34019 kg).

D. Minimum Floor Thickness:

1. Model 50/28F: 9 inch (229 mm).
2. Model 75/30F: 9 inch (229 mm).

E. Equipment Foundation Requirements:

1. Consult factory for drawings.

F. Electronic Programmable Control Panel with Electric Power Unit, UL201 Compliant, 208 volt, three phase, 60 Hz over Hydraulic Cylinder Drive: All models bio-fluid compatible.

1. Power supply at disconnect for each lift is 208 volt, three phase, 60 Hz.

G. Rise: 63 inches (All Models from top of runway to floor).

H. Retracted Height Of Runways:

1. Model 50/28: Flush With Floor.
2. Model 75/30F: Flush With Floor.

I. Platform Length:

1. Model: 50/28F: 28 feet (8534 mm).
2. Model: 75/30F: 30 feet (9144 mm).

J. Overall Length:

1. Model 50/28F: 28 feet (8534 mm).
2. Model 75/30F: 30 feet (9144 mm).

K. Overall Width:

1. Model: 50/28F: 109 inch (2769 mm).
2. Model: 75/30F: 109 inch (2769 mm).

L. Finishes:

1. Red, RAL3002.

M. Accessories:

1. RJ50: Rolling Jacks 50,000 LB (22680 kg) capacity (each) 100 psi minimum - 120 psi maximum required.

    a. Provide Rolling Jacks at **both** lifts.

(OWNER TO SELECT ADDITIONAL ACCESSORIES LISTED BELOW.)

2. Built-In Air Line Kit 100 psi minimum - 120 psi maximum required.
3. Lighting System:

    a. Main lifting platforms shall have fluorescent or LED lights installed on their inner edges to illuminate the work area beneath the vehicle when raised on the lift.
    b. Lighting system shall turn on automatically when lift unit is raised above 22 inches (559 mm), (18 inch (457 mm) lamp height), and shall turn off automatically when lift unit descends below 22 inches (559 mm) per National Electric Code Section 511-1 through 511-3.

4. Ramp Kits for drive-thru bays two each extended length available.
5. Wash Bay (WB) Configurations: Lift will include zinc galvanized primer with marine grade epoxy top coat, environmental coated control panel, stainless remote panel and stainless steel hydraulic fittings and tubing.
6. Stainless steel baseplates
7. Tapeswitches inside, outside or both side of runways.

N. Lift shall be 3rd party certified by ETL testing laboratory and labeled with the ETL/Automotive Lift Institute (ALI) label that affirms the lifts meet conformance to all applicable provisions of American National Standard ANSI/ALI ALCTV-2011 and in compliance with IBC 2003, IBC 2006 chapter 30 section 3001.2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until supporting structures have been properly prepared.

B. If supporting structure preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

A. Install in strict accordance with manufacturer instructions and in proper relationship with adjacent construction. Test for proper operation and retest if necessary until satisfactory results are achieved.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 144500